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ABSTRACT

Each of the seven curriculum modules in this packet for forestry instruction contains a brief description of the module content, a list of the major divisions or units, the overall objectives, objectives by unit, content outline and suggested teaching methods, student application activities, and evaluation procedures. Module titles are Forest Fire Control, Harvesting Timber and Pulp, Operation of Timber Harvesting Equipment, Sealing and Marking Timber, Timber and Log Conversion, Christmas Tree Production and Marketing, and Maple Products Production. (HD)

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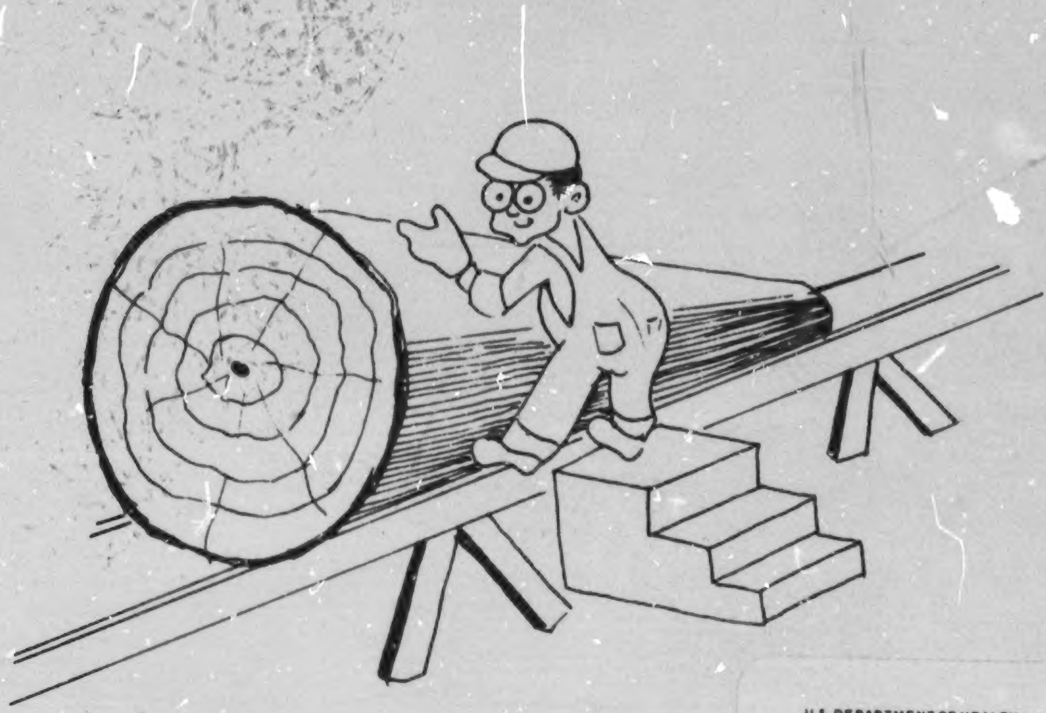
MODULES IN AGRICULTURAL EDUCATION
FOR
# forestry



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Bureau of Occupational and Career Curriculum
Albany, New York 12234

CE 007550

MODULE OF INSTRUCTION

Title - FOREST FIRE CONTROL

Code - 01.0702-01

DESCRIPTION:

This module will give fire control training to men who will be working in all fields of conservation. Students will be involved in the basic concepts and applications of pre-fire measures, including equipment readiness, fire prevention, and knowledge of the area for quick response to any fire situation. They will be involved in the process of pin pointing the location of fires and the use of an Osborne Fire Finder where one is available. Experience will be provided in the use of hand fire fighting equipment, and in the coordination of fire fighters in fighting large fires. The use of fire as a forest management tool will also be examined.

MAJOR DIVISIONS OR UNITS OF CONTENT	Time Allocations Class	 Other
1. Introduction to forest fire control	1	2
2. Presuppression measures	2	9
3. Fire behavior	1	2
4. Fire suppression measures	1	7
5. Fire control equipment	1	4
	6	24

Revised June 1975

MODULE OF INSTRUCTION

Title - FOREST FIRE CONTROL Code - 01.0702-01

OBJECTIVES to be obtained:

The student will be able to:

1. Define orally or in writing five major terms as they relate to forest fire control.
2. Recognize and identify in the field the presence of forest fire risks and hazards.
3. List from memory approximately 85% of the general damaging effects of wildfire to instructor's specifications.
4. List, orally or in writing, four instances in resources management in which prescribed burning may be used.
5. List, orally or in writing, the seven major causes of forest fires, and describe, orally or in writing, several forest fire prevention campaigns specified by the instructor.
6. Record correct readings from weather monitoring equipment, such as the barometer, hygrotherograph, evaporimeter, fuel moisture sticks, thermometer, and anemometer, and observe the use of such data in the setting of fire danger, burning, and buildup indices.
7. Compile a brief descriptive and graphic plan of fire prevention for a specific forest tract.
8. List, orally or in writing, one common organized method of fire detection, and the chain of command of fire control personnel (position titles) having authority over any wildfires occurring in the student's geographical area.
9. Neatly sketch a forest site map accurately depicting location of fuel types by potential rate of spread and resistance to control.
10. Neatly sketch a forest site map accurately depicting planned locations of fire roads, breaks, and equipment caches, and of any fixed point detectors, including a description of a proposed communication system that will rapidly and effectively link any fire site with fire control and supply personnel.
11. Observe, through film or demonstration, the relationship between fuel, temperature, and oxygen in combustion.
12. Observe, through film or demonstration, the influences of fuel types, slope, wind, temperature, and moisture upon fire behavior.

OBJECTIVES to be obtained:

13. Observe, through film or demonstration or in the field, the causes, behavior, and results of the three basic types of fires.

14. State, to the instructor's standards, an acceptable objective for wildfire suppression.

15. Justify the importance of each of the ten rules of conduct on the fire line, either orally or in writing, to the instructor's standards.

16. Observe, through film or demonstration, the steps in decision-making and action required in sizing up and attacking a fire.

17. Respond with accurate decision-making when posed with hypothetical fire line situations, to instructor's standards and specifications in regard to fire conditions, safety, supply, manpower, and efficiency of student response.

18. Demonstrate adequate skill in the selection and operation of available hand and motorized fire equipment in the construction of line (under varying kinds of attack over varying terrain).

19. Demonstrate adequate skill in mopping up a fire including proper steps in assuring isolation of hot spots, removing hot snags and stumps, hand trailing burnable materials, and designating a fire as being out.

20. Demonstrate adequate skill, under hypothetical field conditions, in occupying positions of fire boss, line worker, and equipment operator with responsibilities with respect to safety, decision-making, personnel supervision, and physical operations.

21. Demonstrate with available resources, ability to assemble, store inventory. Check personal fire gear including tools, clothing, and vehicle in a manner conducive to efficient and effective response to a fire call.

22. Demonstrate ability to effectively operate and maintain a fire finder in the accurate plotting of a fire location.

23. Demonstrate ability to properly store, maintain, and recondition representative pieces of fire suppression handtools.

Code - 01.0702-01

Title - FOREST FIRE CONTROL

OBJECTIVES BY UNIT	CONTENT
Unit 1 Introduction to forest fire control Objective 1 Student will be able to (Ibid) define orally or in writing 5 major terms as they relate to forest fire control.	A. Major introductory terms relating to forest fire control . Risk and hazard . Prevention, presuppression, and suppression
Objective 2 Recognize and identify in the field the presence of forest fire risks and hazards.	A. Forest fire risk and hazard observation and identification . Recognition of risk and/or hazard . Recommendations re steps to take in reduction of risk and/or hazard
Objective 3 List from memory approximately 85% of the general damaging effects of wild fire to instructor's specifications.	A. General damaging effects of wild fire on . Soil resources . Water resources . Timber resources . Recreation resources . Wildlife resources . Property loss . Air pollution . Visual pollution . Cost of control . Loss of life . Loss of income . Influences on presence of insects and disease . Other

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
A. Slide presentation. B. Film. C. Field trip. D. Lecture. E. Film - Fire in the Forest U.S.F.S. U.S.D.A.	A. Student participates in lecture-discussion and takes notes for later reference. Observe film.	A. Oral or written exam ré definitions and examples of each of the 5 terms to instructor's standards.
A. Lecture-discussion B. Supervised study	A. Student participates in lecture-discussion ré the nature and kinds of five risks and hazards. B. Student observes and identifies various kinds of risks and hazards in the field. C. Student orally recommends means for reduction of actual fire risk and hazard problems. (A film may suffice for field observation).	A. Oral or written field report on presence of five risks and hazards by type to instructor's standards.
A. Lecture-discussion	A. Student participates in lecture-discussion and takes notes for further reference. Observe film.	A. Achieve 85% proficiency in writing a list of general damaging effects of wild fire to instructor's specifications.

Code - 01.0702-01

Title - FOREST FIRE CONTROL

OBJECTIVES BY UNIT	CONTENT

Unit 1 (cont'd)
Objective 4
List, orally or in writing, 4 instances in resources management in which prescribed burning may be used.
	A. Fire as a management and ecological tool
	. Fuel reduction measure
	. Jack pine and long leaf pine management
	  . regeneration
	  . site preparation
	. Waterfowl management
	  . marsh opening
	  . vegetation change
	. Upland game management
	. Ecological impacts
	  . over protection and climax types low in productivity (preserves, etc.)
	  . frequent or hard burns and site degeneration
	  . successional vegetative changes

Unit 2
Presuppression measures
Objective 5
List, orally or in writing, the 7 major causes of forest fires; and describe, orally or in writing, several forest fire prevention campaigns specified by the instructor.
	A. Prevention
	. Education
	  . major causes of fires (incendiary, debris burning, smokers, campers, railroads, lumbering, lightning)
	  . National and State fire prevention on campaigns

Objective 6
Record correct readings from weather monitoring equipment such as the barometer, hygrotherograph, evaporimeter, fuel moisture sticks, thermometer, and anemometer - and observe the use of such data in the setting of fire danger, burning, and buildup indices.
	. Rating systems
	  . fire danger, burning, and buildup indices
	  . measurement of relative humidity, rate of evaporation, temperature, wind speed
	  . use of fuel moisture sticks

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
A. Lecture-discussion B. Field trip	A. Student participates in lecture-discussion and takes notes for later reference. B. Student may observe land areas in need of, in the process of, or showing the results of a program of prescribed burning. (A film may suffice for field observation).	A. Oral or written exam ré 4 uses of prescribed burning as an ecological tool to achieve 85% proficiency to instructor's specifications.
A. Lecture-discussion. B. Display representative bulletins, brochures, posters ré fire prevention campaigns. C. Class project.	A. Lecture-discussion participation students participate in organized groups. B. Local wild fire prevention campaign on small one shot basis (1/2 hrs. to design posters to be run off in school and distributed; short news media spots; etc.)	A. Oral or written exam ré 7 major causes of forest fires, and a number of national fire prevention campaigns specified by the instructor to an 85% proficiency.
A. Field trip. B. Qualified guest lecturer-demonstrator C. Work experience "Application of the National Fire Danger Rating System"	A. Field lecture-discussion w/ fire warden, forest officer, instructor, etc. demonstrating compilation of data for rating systems. Student participates in data gathering.	A. Instructor observation of student work and evaluation of student instrument data recording as to accurateness and neatness to instructor's standards.

OBJECTIVES BY UNIT	CONTENT
Unit 2 (cont'd) Objective 7 Compile a brief descriptive and graphic plan of fire prevention for a specific forest tract.	. Fire prevention planning . forest area overall management plan . hazard reduction (remove snags and slash) . risk reduction (law endorcement, burning permits control access to woods) . patrolling to reduce presence of risk
Objective 8 List, orally or in writing: 1 common organized method of fire detection; and the chain of command of fire control personnel (position titles) having authority over any wild fires occuring in the student's geographical area.	B. Presuppression . Fire control planning . fire detection (towers, aerial observers, roving ground patrols, combinations thereof) . organization of Federal, State, County, and local fire control personnel . organizational line of personnel . crew training (1st, 2nd, and 3rd line crews) . forest site mapping re . fuels . potential rate of fire spread . potential resistance of fire to control
Objective 9 Neatly sketch a forest site map accurately depicting location of fuel types by potential rate of spread and resistance to control.	. Forest site mapping re . fuels . potential rate of fire spread . potential resistance of fire to control

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
A. Field lab exercise. B. Field data gathering. C. Field lecture-demonstration. D. Handout: graphic representation of example site.	A. Student reconnoiters forest site assigned to him for duration of module. Student should be provided a topographic map of the site showing existing boundaries, physical and man-made features. Students provided w/ existing or hypothetical management plan for the site. Student plots risks and hazards and schedules all measures for risk and hazard reduction.	A. Evaluation of plotted data to instructor's specifications and standards.
A. Field trip. B. Lecture-discussion. C. Chart (organizational) handout	A. Participation in lecture-discussion; visit to headquarters for area fire control.	A. Suggest no evaluation needed - may test on memorization of organizational setup for fire control.
A. Field lab exercise. B. Field data gathering. C. Field lecture-demonstration. D. Handout: graphic representation of example site.	A. Student uses map in coding forest site by potential rates of fire spread and resistance to control.	A. Evaluation of plotted data to instructor's specifications and standards.

OBJECTIVES BY UNIT	CONTENT
Unit 2 (cont'd) Objective 10 Neatly sketch a forest site map accurately depicting planned locations of fire roads, breaks, and equipment caches, and of any fixed point detectors; including a description of a proposed communication system that will rapidly and effectively link any fire site with fire control and supply personnel.	B. Presuppression (cont'd) . Forest site preparation . fire roads . fire breaks . fire control equipment caches . detection system . communications system
Unit 3 Fire behavior Objective 11 Observe, through film or demonstration, the relationship between fuel, temperature, and oxygen in combustion. Objective 12 Observe, through film or demonstration, the influences of fuel types, slope, wind, temperature, and moisture upon fire behavior. Objective 13 Observe, through film, or demonstration, or in the field, the causes, behavior, and results of the 3 basic types of fires.	A. How fire burns . Triangle B. Fire spread . Fuel . fast burning fuels . slow burning fuels . Slope . draft . preheating . spread (chunk rolling) . Weather . wind . oxygen . spread via spots . internal current . night and day . temperature . preheat . fatigue "firemens"

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
A. Qualified guest field lecturer-demonstrator. B. Field lab exercise. C. Field data gathering. D. Handout: graphic representation of example site.	A. Student uses his prepared forest site map to plot his recommended layout of fire roads, breaks, caches, and fixed point detectors: to include a written summary of necessary communications network for adequate fire control. B. Much of the supporting data for the student's work may best be obtained through his exposure to the experience of active or retired fire control personnel in the field.	A. Evaluation of plotted data and written discussion to instructor's standards and specifications.
A. Film. B. Lecture-discussion. C. Demonstration. D. Field observation. E. Solution of fire situations or problems F. Fire simulator (N.Y.S. Department of Environmental Conservation). (obtaining the use of the simulator would be valuable but may prove impossible - but use it if the opportunity presents itself).	A. Student participates in lecture-discussions, observe representative films, observes demonstrations, observes going fires if possible, observes in field the conditions which influence fire behavior. B. Student responds in the field to hypothetical live fire conditions with forecasts of fire behavior.	A. Oral or written exam to test extent of student understanding re the relationship between fuel, temperature, and oxygen in combustion to instructor's standards. B. Evaluation of student forecasts re fire behavior given a set of circumstances to instructor's specifications and standards.

OBJECTIVES BY UNIT	CONTENT
Unit 3 (cont'd) Objective 13 (cont'd)	B. Fire spread (cont'd) . Weather . moisture . night and day . fuel intake . Parts of the wildfire . head . flank . tail . Basic types of fires . ground fire . surface fire . crown fire
Unit 4 Fire suppression measures Objective 14 State an acceptable (to instructor's standards) objective for wildfire suppression. Objective 15 Justify the importance of each of the 10 rules of conduct on the fire line either orally or in writing to instructor's standards.	A. Suppression objective B. 10 rules of conduct on the fire line . Keep informed of fire weather conditions . Know what your fire is doing at all times . Base all actions on current behavior of fire . Have escape routes planned for all men . When possible post lookouts on the fire . Be alert, keep calm, think clearly, and act decisively . Maintain prompt communications with your men, your boss, and other forces . Give clear instructions and be sure they are understood . Maintain control of your men at all times . Fight fire aggressively but provide for safety first

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
		C. Oral or written exam testing student's ability to classify by type an actual or depicted forest fire and his ability to forecast the behavior of a fire type given a set of fire and environmental data to instructor's standards and specifications.
A. Lecture-discussion.	A. Student participates in lecture-discussion. B. Student orally contributes in general class preparation of examples that illustrate the possible consequences of breaking any of the 10 rules of conduct on the fire line.	A. Evaluation of written or oral statement of suppression objective to instructor's specifications and standards. B. Evaluation of written report or exam based on instructor's specifications and student contributions to instructor's standards.

OBJECTIVES BY UNIT	CONTENT
Unit 4 (cont'd) Objective 16 Observe through film or demonstration the steps in decision-making and action required in sizing up and attacking a fire. Objective 17 Respond with accurate decision-making when posed with hypothetical fireline situations (to instructor's standards and specifications in regard to fire conditions, safety, supply, manpower, and efficiency of student response).	C. On the fireline . Sizing up fire . natural barriers . slopes . fuels, etc. . point of attack . head . flank . tail . Initial attack . anchoring fireline to barrier . availability of present suppressants . dirt . water . fireline construction tools . Methods of attack . direct attack at fireline . 2 foot method (fireline ahead of fire) . parallel method (fireline is parallel to head of fire) using backfiring . indirect method (falling back to a ridge, river, or other natural barrier . Possible loss of firelines . reach . gravity . sparks . snags . wind burns . convection . radiation

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
A. Movies. B. Chalk talk. C. Field exercises. D. Field trip. E. Films - Water on the Fire - U.S.F.S. U.S.D.A. Building the Fireline U.S.F.S. U.S.D.A. Crew Boss U.S.F.S. U.S.D.A. Fire Plow Performance & Use U.S.F.S. U.S.D.A. Fire V.S. Fire U.S.F.S. U.S.D.A.	A. Students provided with topographic map, aerial photos of a given wild land area. Instructor specifies the location of a hypothetical fire, its size, boundaries, type, rate of spread, fuel materials present; the fire control materials at hand. B. Students hypothetically size up and attack the fire. C. Example problem may be repeated with different hypothetical fires at different sites. D. Previous to example problem students should have been exposed to factors of fire behavior and control in the field.	A. Instructor evaluate student decision-making ability when posed with hypothetical fireline situations to instructor's specifications re fire conditions, safety, supply, and man power; to instructor's standards.

OBJECTIVES BY UNIT	CONTENT
Unit 4 (cont'd) Objective 18 Demonstrate adequate skill in the selection and operation of available hand and motorized fire equipment in the construction of line (under varying kinds of attack over varying terrain).	D. Fireline construction . Hand tool . fire rake . fire swatter . shovel . back-pack pump . drip torch . ax and saw . Heavy equipment . dozer . fire plow . hydro-seeder . Small motorized equipment . failing tool . field pump . Special conditions . slope . snags . rocky area, etc. . Backfiring
Objective 19 Demonstrate adequate skill in mopping-up a fire including proper steps in assuring: isolation of hot spots; removing hot snags and stumps; nand trailing burnable materials; and designating a fire as being out.	E. Mop-Up . Concept . Procedures . Concluding (when safe) . Special conditions . snags . stumps . underground creep

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
A. Film - Only a Bunch of Tools U.S.F.S. Dept. of Ag.	A. Student participates in line construction using as many of the various hand and power equipment pieces as possible Student assumes variety of staff and line personnel positions. B. Organize students into small crews (10). Tools are issued and along a flagged section a fireline is constructed. Review by pointing out mistakes (not raking around stumps, etc.) and correct procedures used.	A. Evaluation by field observation of student ability re measures of tool selection, efficiency and effectiveness of operation, and safety in equipment operation.
A. Demonstration B. Supervised practice	A. Recommend students mop-up a site actually burned complete with hot stumps and hot downed materials. Hot snags to be felled in such an exercise would pose extreme hazard to students and fire containment - do not recommend students work on snags. Overall it would be good for students to put their hands into the hot char to get a realistic exposure to the job.	A. Evaluation by field observation of student ability re measures of tool selection, efficiency and effectiveness of operation, and safety in equipment operation. B. Evaluation of ground area assigned to student as to his effectiveness in rendering all hot spots dead out.

OBJECTIVES BY UNIT	CONTENT
Unit 4 (cont'd) Objective 20 Demonstrate adequate skill, under hypothetical field conditions, in occupying positions of fire boss, line worker, and equipment operator with responsibilities with respect to safety, decision-making, personnel supervision, and physical operations.	F. Small crew organization . Equipment dispersal . Individual responsibility . fire boss . line worker . equipment operators . Safety . first aid kit . drinking water . communications . escape route . foot
Unit 5 Fire control equipment Inventory and maintenance Objective 21 Demonstrate with available resources ability to assemble, store inventory. Check personal fire gear including tools, clothing, and vehicle in a manner conducive to efficient and effective response to a fire call.	A. Fireman's Requirements for fast action . Fire gear ready at all times . fire box . tool cache . regular inventories and checks on equipment . Personal preparedness . physical condition . proper clothing . Travel . vehicle in good repair . maps to assist operator in knowing how to get to a fire . use of hand compass . declination . azimuth . back azimuth

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
A. Lecture-discussion	A. Student participates in line construction using as many of the various hand and power equipment pieces as possible. Student assumes variety of staff and line personnel positions. B. Organize students into small crews (10). Tools are issued and along a flagged section a fireline is constructed. Review by pointing out mistakes (not raking around stumps, etc.) and correct procedures used.	A. Evaluation by field observation of student ability in supervisory, line, and operator personnel positions to instructor's standards of efficiency and effectiveness re communications, operations, and safety.
A. Lecture-discussion-demonstration. B. Inspection of student preparedness.	A. Student may requisition from school supplies those pieces of fire gear he would deem adequate for fire control preparedness. B. Student may present himself in class on the day of this exercise dressed properly for fire control work. C. Student conduct an inventory and check for fitness on his personal fire gear. D. Student present himself and his selected gear for instructor inspection.	A. Evaluation by inspection.

Code - 01.0702-01

Title - FORREST FIRE CONTROL

OBJECTIVES BY UNIT	CONTENT
Unit 5 (cont'd) Objective 22 Demonstrate ability to effectively operate and maintain a fire finder in the accurate plotting of a fire location.	B. Use of fire finder . Learning country . local landmark reference . aids, i.e. (car dust to locate roads) . tower records . industrial smokes, etc. . locating and identifying smoke . systematic scan method . tower records . legitimate smoke . false smoke . illegitimate smoke . patrol use . R.R. tail, etc. . Smoke location fix . leveling fire finder . orienting fire finder map disk . care of fire finder and function of parts . measuring angles . vertical . horizontal . use of angles . fix location . determine fire size . intersect method of fixing location . two or more towers . reporting . location . size . smoke drift . probable equipment needed

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
A. Field and/or classroom lecture-discussion-demonstration. B. Parts breakdown, maintenance, and assembly demonstration. C. Work experience. D. Guest lecturer-demonstrator in field.	A. Student observe use and breakdown of fire finder in the field. B. Student use fire finder to accurately plot the location of a real or hypothetical smoke using vernier scale. C. Locate on fire finder an azimuth reading. State another reading from a fixed hypothetical tower and student will state fire location via intersect method.	A. Evaluation by: . testing student familiarity with 12 of 15 fire finder instrument parts and their function and placement. . observing student's point plotting of a smoke to within 30 minutes using the vernier scale to instructor's standards of efficiency. . observing student's point plotting of a fire on a topographic map from hypothetical bearings from tower sights to within 1/4 mi.

OBJECTIVES BY UNIT	CONTENT
Unit 5 (cont'd) Objective 23 Demonstrate ability to properly store, maintain and recondition representative pieces of fire suppression handtools.	C. Maintenance of suppression handtools . Objective . preparedness . user safety . inventory . Reconditioning . removal of handle . insertion of handle . wedging of handle . aligning of handle . smoothing of handle . sharpening heads . ax . Pulaski . brush hook . fire rake . shovel . sledge . mattack . rust prevention . Care and maintenance . back pack pumps . metal . rubber . fire hose . rolling . storage . marking ends . backfiring devices . storage

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
A. Lecture-discussion.	A. Student participation in lecture-discussion-demonstration.	A. Evaluate by observation and inspection student ability to effectively and efficiently recondition a handtool.
B. Work experience.	B. Using mimeo guides, students will handle, align and thoroughly recondition a handtool. Two-man teams will roll and unroll lengths of fire hose (canvass).	B. Evaluate by oral or written examination student understanding of proper care and maintenance of handtools, back pack pumps, hose, and backfiring devices to instructor's specifications and standards.
	C. Student visit local fire house for tour and tool cache inspection.	

MODULE OF INSTRUCTION

Title - FOREST FIRE CONTROL Code - 01.0702-01

RESOURCE MATERIALS

Books -

1. Fireman's Handbook - U.S.F.S., U.S.D.A.
2. Introduction to the Fundamentals of Fire Behavior. Programmed Learning. U.S.F.S., U.S.D.A.
3. National Fire Danger Rating System - U.S.F.S., U.S.D.A.
4. Forest Fire: Control and Use. Davis.
5. Manual for Forest Fire Control - U.S.F.S., U.S.D.A.

Audiovisuals -

16mm Films U.S.F.S., U.S.D.A., Motion Picture Service; Washington, D.C. 20250.

1. Fire in the Forest, 22 min.
2. Building the FireLine, 27 min.
3. Only a Bunch of Tools
4. Water on the Fire, 27 min.
5. Crew Boss, 35 min.
6. Fire Plow Performance and Use, 14 1/2 min.
7. Fire VS Fire, 20 min.
8. Suggest as "openers" - Then It Happened
9. Magic of Fire. U.S. Dept. of Interior; U.S. Bureau of Mines.
10. The Enemy Is Fire, 25 min. (Rarig's Inc., 2100 North 25th St., Seattle, Washington.98103).

MODULE OF INSTRUCTION

Title - HARVESTING TIMBER AND PULP Code - 01.0703-01

DESCRIPTION:

The students will lay out a forest area of appropriate size for the length of the module, locate access roads, and loading sites. The students will then prepare the area for actual forest operations and begin the harvesting process. Emphasis will be placed on the student's ability to lay out the wood lot, observe proper safety procedures, work as a crew member, and properly go through the steps of felling, bucking, limbing, skidding, and loading timber and pulp. Instruction will also include daily field maintenance of all harvesting equipment.

Students will develop a knowledge of harvesting methods that benefit multiple use and sustained yield management planning by proper sale contract writing and planning. It is recommended that the Module, Operation of Timber Harvesting Equipment be a prerequisite to this module.

DIVISIONS or UNITS of content	Time Allocation	
	Class	Other
1. Base Map Preparation	2	1
2. Proposed Operation Plan	2	2
3. Timber Sale Contracts	2	1
4. Multiple Use Objectives	1	1
5. Harvesting Safety	0	4
6. Working Procedures	0	4
7. Crew Assignment	0	4
8. Equipment Field Maintenance	0	4
9. Chain Saw Daily Field Maintenance	1	1
	8	22

Revised June, 1974

MODULE OF INSTRUCTION

Title - HARVESTING TIMBER AND PULP Code - 01.0703-01

OBJECTIVES to be obtained:
The student will be able to:

1. Students will develop a planning base map for approximately a 10-acre potential timber harvest area.

2. Students will sketch on proposed plan of objective #1 the potential harvest area, cutting type, sale area boundaries, roads, fire lane, water supply, erosion hazard areas, stream bottoms, loading and landing area, developments or any other multiple use considerations.

3. Following supplied sample timber sale contracts, the student will develop contract specifications for operator responsibility (i.e. road and stream side zones, stump height, road grades, etc.) for harvest area described in objectives # 1 and 2.

4. Student will state on paper a minimum of fire multiple use objectives met through the planned timber harvest of objective #1 (i.e. grouse, den trees retained at proper density, stream protection, etc.).

5. Students to participate in wood harvesting techniques. Safety will be practiced on the job at all times by all students in the following manner: 1) hard hats will be worn at all times, 2) equipment will be checked daily, 3) lodged tree will be pulled down, 4) crew size will not exceed 4 men, 5) signals will be used to indicate falling trees, 6) proper footwear will be worn and gloves for handling cable. Crew bosses and instructors will enforce safety rules.

6. Proper felling procedures will be followed by students as to notching, direction of fall - salvage of existing stand, and damage to harvested log. On a given job not over 1 tree of 4 cut, will become lodged, not over 3 standing trees will be damaged, and not over 1 harvested log will be damaged due to improper cutting.

7. Students will be rotated in various phases of operation to gain work experience in crew harmony and correlate job efficiency to the harvest production rate.

8. Students will maintain all assigned harvest equipment under field conditions to support harvest operation continuity and productivity.

9. Students will answer 9 of 10 questions on chain saw daily field care through application of field experience and assigned self study instructional aids.

Code - 01.0703-01

Title - HARVESTING TIMBER AND PULP

OBJECTIVES BY UNIT	CONTENT
1. Base Map Preparation 1. Students will develop a planning base map for approximately a ten acre potential timber harvest area.	A. Plan Map base . Air photo . Topographic map . U.S.D.A. Soil Survey Maps . Plane table and interior traverse B. Working Scale . Pantograph . Tracing . Choice C. Map Detail . Property lines . Corer type boundaries . Existing man made structures . Location description
2. Plan 2. Students will sketch on proposed plan of objective #1 the potential harvest area, cutting type, sale area boundaries, roads, fire lane, water supply, erosion hazard areas, stream bottoms, loading and landing area developments, or any other multiple use consideration.	A. Presenting Proposals . Overlays B. Harvest Considerations . Major land use objective . Cutting type . selection . other . Harvest area . acres by type . establishing cutting boundaries . paint slash . posters . cutting units . roads . main haul . interior . fire Responsibility . suppression tool location . water supply . erosion hazard areas . slopes . trail placement . side cuts . stream bottoms . loading and landing sites . accessibility . types - skidways, etc.

EDUCATION

01.0703-01 - Code

HARVESTING TIMBER AND PULP - Title

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
Lecture and Discussion Illustrations of sale area sketches Illustrations of potential aids available for Map base (i.e. air photo, Soil Survey Maps, topo maps, etc.) Field reconnaissance and class application	Using selected base map aids and field study, student will develop sketch of proposed sale area.	Accuracy check of individual maps for required detail.
Lecture and Discussion Illustrations of sale area planning Field reconnaissance and class application Viewing of a recent sale area	Using field reconnaissance and guides for harvest considerations, student will plan out potential sale area.	Accuracy check of individual sketches and proposals.

Code - 01.0703-01

Title - HARVESTING TIMBER AND PULP

OBJECTIVES BY UNIT	CONTENT
3. Timber Sale Contracts 3. Following supplied sample timber sale contracts, develop contract specifications for operator responsibility for the harvest area described in obj. #1.	A. Contract . Need . Written . Seller-buyer safeguards B. Sales . Unit . Lump Sum C. Meeting Land Use objectives . Stump height . Roadside slash removal . Slash lopping . Erosion control measures . water bars . sodding log roads . Stream protection zones . log road-bridge construction . water bars . Fire Responsibility . Tree Marking System . saw log slash . pulpwood spot . cutter's choice . Diameter limitation . Truck Rules and Regulations
4. Multiple Use Objectives 4. Student will state on paper a minimum of fire multiple use objectives met through the planned timber harvest of objective #1 (i.e. Den trees retained at proper density, stream protection, etc.)	A. Multiple Use and Sustained Yields . Definition B. Forest Management . Increased yields . Stand shaping . Harvest material . Fire control C. Wildlife . Den trees . Openings and edge . Food types . Corer types D. Water . Quality and quantity . Stream zones . shading . siltation . yield sustainment E. Soil . Erosion measures . Scorification . Soil horizon retention F. Grazing G. Recreation . Esthetics

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
Lecture and Discussion Samples of various contracts Field reconnaissance and written application	Using contract samples and gathered field information, student draws up a contract (excluding monetary measures) that gets the harvest done following multiple use objectives	Completeness and accuracy Check of contract specifications
Lecture and Discussion Field visitation Student participation Films	Student will think about what he has accomplished in following multiple use concepts and indicate by listing the benefits of his harvest plans.	Student evaluated by oral or written means on his correlation of timber harvest and multiple use.

Code - 01.0703-01

Title - HARVESTING TIMBER AND PULP

OBJECTIVES BY UN[illegible]	CONTENT
5. Harvesting Safety 5. Students to participate in wood harvesting techniques. Safety will be practiced on the job at all times by all students in the following manner: 1) hard hats worn, 2) daily equipment checks, 3) lodged trees pulled down, 4) crew size of 4 men, 5) signals for falling trees, 6) gloves and footwear. NOTE: This module assumes that Operation of Timber Harvesting Equipment has been completed.	A. Job Safety . Liability insurance . Compensation rates . Safety and frequency rates B. Equipment (Personal) . Shinguards . Nylon chaps . Patches . Gloves and glasses . Hard hat . Footwear . First aid kit C. Equipment (Devices) . Canopies . Seat belts . Signal devices . sound . visual . Guards . Winching D. Working Area . Crew placement . Electrical storms . Wind storms . Road guards E. Tool Transportation . Hand tools . Walking distance between co-workers . Proper carriage . Vehicle transportation

EDUCATION

01-0703-01 - Code

HARVESTING TIMBER AND PULP - Title

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
Lecture and Discussion Student Participation Film (Safety)	Each day a new safety officer will be given a special color hard hat. He will enforce and inform workers of safety rules. At the day's end, or week's end, safety officers will hold a discussion.	Student evaluated by willingness to accurately follow prescribed safety rules.

OBJECTIVES BY UNIT	CONTENT
6. Working Procedure 6. Proper felling procedures will be followed by students as to notching, direction of fall, salvage of existing stand, and damage to harvested log. On a given job not over 1 tree/4 will become lodged, not over 3 standing trees will be damaged, and not over 1 harvested log will be damaged due to improper cutting.	A. Note Content is reinforcement of that located in Module Operation of Timber Harvesting Equipment. B. Swamping out tree and starting saw . Cut small trees and brush around tree to be harvested . Plan escape route C. Preparation for felling of trees . Check lean . angle . weight of tops . wind . Other trees . Slope of ground . Check for snags on other trees . Skidding location D. Notching .. Undercut - directions of fall . 1/4-1/5 diameter of tree . cut out wedge E. Felling tree . Felling cut . 1"-2" above undercut . sound alarm . cut to within 2" of undercut, then wedge . as tree falls, retreat and sound alarm F. Bucking timber and pulp . Timber logs . limbing - from base toward top - standing opposite cutting - cut limbs flush with log - cut off all limbs (lopping tops) - make sure all limbs contact ground . bucking logs . determine length wanted for market use . shape of log . full length stems - to be bucked later . Pulp . bucking pulp . market demand 4' or 8' length . shape of log . properly trimmed . squared end of log . lopping top

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
Field application in work situations Discussion, go over theory of operation Field trip Charts of felling methods and various notches Handout copies for students to keep Demonstrations, go through total felling procedure first Demonstration - limbing - bucking - safety Chart showing proper stance and sketches of topping Field trip	Students alternate in felling crews	Student can be evaluated by ability to fell trees
	1^1	

OBJECTIVES BY UNIT	CONTENT
7. Crew Assignment 7. Students will be rotated in various phases of operation to gain work experience in crew harmony and correlate job efficiency to the harvest production rate	A. Working assignments . Felling crew . Bucking and limbing . Skidding . Loading . Piling . Scaling . Truck driving B. Crew Harmony . "Horse play" . Unnecessary discussion . Utilization of working time C. Job Efficiency . Relation to job harmony . Personal output - total production . Safety
8. Equipment Field Maintenance 8. Students will maintain all assigned harvest equipment under field conditions to support harvest operation continuity and productivity.	A. Field Care . Personnel . warm weather . water . insect repellent . cold weather . clothing . Equipment . warm weather . boil outs . fuel storage . oil changes . cold weather . cooling systems . "sweating" of equipment . starting aids . Tool Storage . containers . variety selection . fitting to various jobs . spare parts
	12

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
Discussion Student Participation	Students participate in different phases of harvest operation. On sight representations of job "slow downs" will be observed and corrected	Work evaluation in phases of total operation
Field application through student participation Discussion and viewing of a job in progress	Student will keep operation going by doing all maintenance possible on the job Students will view a job in progress and make notes of job slow downs (i.e. arrive at woods without spare saw chain, chain saw but forgot oil to operate, etc.)	Student will be evaluated on input of actual work operation

OBJECTIVES BY UNIT	CONTENT
9. Chain Saw 9. Students will answer 9 of 10 questions on chain saw daily field care through application of field experience and assigned self study instructional aids	A. Chain Parts . Cutters . Drive links . Center links . Side links . Preset cutters and links B. Cutter Types . Chipper tooth . Chisel . Crosscut C. Cutting Edges of Chipper Tooth . Top plate . Top cutting edge . Side cutting edge . Depth gauge . Gullet D. Care and Maintenance . Joint . Filing • hand • machine . Chain lubrication . Chain tension E. Power Head . Maintenance • cleaning • fueling and lubrication • trouble shooting . Drive lugs F. Cutting Bar . Maintenance • groove

EDUCATION

01.0703-01 - Code

HARVESTING TIMBER AND PULP - Title

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
Self Teaching Guides Field application Discussion	Students who are felling, etc. and using saws will perform daily field maintenance Students will also study self teaching guides in preparation for evaluation	Students can be evaluated on saw performance in the field by checking against a check list A written evaluation will be made on the self teaching guides

Title - HARVESTING TIMBER AND PULP　　Code - 01.0703-01

RESOURCE MATERIALS

Books -

1. Forestry Handbook. Forbes. New York. Ronald Press.
2. Pulpwood Production. W.S. Bromley. Interstate Printer. Dansville, Illinois
3. Forest Technology. U. S. Government Printing Office. No. FS 5.280:80054.
4. Northeastern Loggers Handbook. U. S. Forest Service - USDA.

Bulletins -

1. Logging Farm Wood Crops. USDA. Bulletin - 2090.
2. Safety Code for Logging (Oregon). Industrial Accident Commission. Salem, Oregon. 97310.

Periodicals -

1. Northern Logger Magazine. Boonville, New York.

MODULE OF INSTRUCTION

Title - OPERATION OF TIMBER HARVESTING EQUIPMENT   Code - 01.0703-02

DESCRIPTION:

This module stresses safe and effective selection, use and maintenance of timber harvesting equipment. This includes tools and equipment used in the felling of trees and the bucking, yarding, skidding, and loading of timber and pulp wood. Students will be rotated through the various stages of timber harvesting so they will get experience in the whole process. The students will spend all of their time in the field situation using equipment common to the area.

MAJOR DIVISIONS OR UNITS OF CONTENT	Time Allocation Class	Other
1. The felling of a tree in a forest situation	0	6
2. The limbing of a tree in preparation for skidding and loading	0	6
3. The bucking of a tree into timber and pulp wood	0	6
4. The skidding of timber safely from the woods to the loading site	0	6
5. The proper and safe techniques in loading timber and pulp wood	0	6
	0	30

MODULE OF INSTRUCTION

Title - OPERATION OF TIMBER HARVESTING EQUIPMENT

Code - 01.0703-02

OBJECTIVES to be obtained:

The student will be able to:

1. Under forest conditions and under the direction of a crew boss, safely fell a tree without getting it hung up.
2. Safely limb a felled tree to the satisfaction of the instructor.
3. Safely buck a felled tree to the proper lengths depending upon the future use of the timber.
4. Demonstrate the safe use of all local methods of skidding timber to the loading site.
5. Safely load timber and pulp wood, using methods used locally and bind that load in preparation to moving the load.

Code 01.0703-02

OPERATION OF TIMBER HARVESTING EQUIPMENT

OBJECTIVES BY UNIT	CONTENT
Unit 1 - The Felling of a Tree in a Forest Situation Objective 1 The student will be able to, under forest conditions and under the direction of a crew boss, safely fell a tree without getting it hung up. Unit 2 - The Limbing of a Tree in Preparation for Skidding and Loading Objective 2 The student will be able to safely limb a felled tree to the satisfaction of the instructor. Unit 3 - The Bucking of a Tree in Timber and Pulp Wood Preparation Objective 3 The student will be able to safely buck a felled tree to the proper lengths depending upon the future use of the timber.	A. Safe and effective operation of felling, limbing and bucking tools . Wear hard hat, steel tie boots, knee safety patches . Felling . clear obstacles away . check tree for: . get away route . hazardous falling . limbs and bark . lean . wind . size re-depth of backcut . the undercut . the backcut . Prying lodged trees . Using wedges . Limbing . use axe on small limbs . use chainsaw on large limbs . cut parallel and close to log B. Bucking . a definition--cutting trees into logs or bolts . choose hand or power saw re. size of logs . keeping saw blade out of the dirt . skids . bucking ladder . bucking shute . minimize pinching of saw . buck on uphill side of log

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
A. Teacher demonstration of felling a tree after pointing out the safety aspects necessary before cutting the tree. B. Students reciting safety points and going through the cutting process verbally before actually felling the tree.	A. Recommend instructor return with class to site of trees marked for cutting and have students practice felling, limbing, and bucking operations on those trees marked for cutting. B. Students should first be outfitted with properly fitting hard hats, steel toed boots, and knee safety patches.	A. All evaluation of student performance in terms of quantity of work accomplished must be specified by the individual instructor.Standards must be based upon terrain,ground conditions,timber type,log and tree sizes,equipment used, and any other factors of particular importance to the evaluation of a class. B. Evaluation is the successful felling of a tree to industry's standards.
A. Teacher demonstration pointing out safety points a student must be conscious of.	A. Instructor demonstrate proper preparation for dropping of a tree; then drop it. Instructor limb tree correctly end buck it up. Throughout demonstration instructor should discuss his thoughts and actions on the dropping,limbing,and bucking of the tree. B. Stress safety throughout the entire procedure. C. Students should learn the correct methods for bringing down a tree that has hung up.	A. Demonstrate the safe limbing of a tree.
A. Teacher demonstration of bucking from top of log and from below to prevent pinching saw.	A. Safe and effective felling, limbing,and bucking of trees with proper equipment and methods.	A. Demonstrate the ability to buck a felled tree to the appropriate length depending upon its future use.Demonstrating both top and bottom cutting methods at the appropriate place.

OBJECTIVES BY UNIT	CONTENT
Unit 3 - (continued)	. Log elevators . periodic check on soundness of pans, sleds, arch, drawbars . regular check on lubrication of hydraulic equipment . Chocking and hookup equipment . rust, flattening, splitting, and scoring of cable and chain links . tightness of head on grab skipper . tightness of connecting pins of tongs, sheckles, hooksets . sharpness of grab skipper, tong point . soundness of wire rope splices . repair links on chain and splicing of cable C. Safe and effective operation of skidding equipment . Transporting equipment . fire safety and use of proper fire extinguishing equipment . safe number of people to operate equipment . use of hand signals . use of helpers on the ground . minimizing damage to residual stand . proper handling of transmission . speeds . continuous observation of gauges . transaction in woods operation . training methods for horses . crossing, obstacles, gulleys, steep ground

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES

OBJECTIVES BY UNIT	CONTENT
Unit 4 - The Skidding of Timber Safely from the Woods to the Loading Site Objective 4 The student will be able to demonstrate the safe use of all local methods of skidding timber to the loading site.	A. Equipment Identification . Transporting equipment . horse-harness and . whiffletree . farm tractor . rubber tired "tree farmers" . crawlers . Log elevators . skidding pan . sled . logging arch . hydraulic lifts . drawbar . winches . Chocking and hookup rigging . chocker . skidding tongs . binding logs with chain . slip hook . grab hook . log grabs and grab skipper . chain . wire rope . spleed eyes . shackles . basket hooks B. Daily and continuous maintenance of skidding equipment . Transporting equipment . care and feeding of horses . maintenance of horses . following regular daily maintenance schedule for tractors and crawlers . observing operation rules specified in manufacturers instructions manuals

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
A. Review information in "Rope Knowledge for Riggers." Demonstrate safe hook up and chocking of logs,use of skidders available to the teacher,and maintenance of this equipment. Field trip to logging area.	A. Instructor rarely can have all skidding equipment on hand. Recommend instructor to take class on field trip to logging operations, equipment dealers, and equipment owners to familiarize students with all the skidding equipment. Whenever possible students should be able to observe equipment under working conditions. The field trips may take two days and be used to train students in both the identification and in the "observable parts" of daily and continuous maintenance of skidding equipment.	A. Demonstrate the ability to safely skid logs to the loading area.
	A. Students should be given experience in daily maintenance on all motorized equipment available to the instructor. B. Students should read maintenance manuals and instructor prepared schedules for all motorized equipment,chain, cable,rope and all other skidding equipment. C. Students should be provided with some pieces of equipment in definite need of maintenance and demonstrate the ability to correctly maintain it. D. Most of the maintenance will be carried out simultaneously while learning the safe and effective operation of skidding equipment.	

OBJECTIVES BY UNIT	CONTENT
Unit 4 - (Continued)	. Log elevators . relative distance of units from motor vehicle . turning with elevator in tandem . getting through areas of poor traction . proper positioning of hydraulic lifts and drawbars re tractor stability . crossing obstacles,gulleys,steep ground . keeping slack out of the line and not jerking the line with a winch . Chocking and hookup rigging . setting the chocker,tongs,or binding . chain . tighteners . secure hookup . use of eyes,shackles,hooks,etc . splicing of wire rope . selection of proper size chain and cable . leverage,stress,strain
Unit 5 - The Proper and Safe Techniques in Loading Timber and Pulp Wood Objective 5 The student will be able to safely load timber and pulp wood,using methods used locally, and bind that load in preparation to moving the load.	A. Equipment Identification . Smallwood . pulphook . powered conveyor . pulpwood loaded on pallet . pulpwood loaded with cable sling . Hand methods for loading logs . skidway . Peavy or cant hook . Log loading devices . crosshand . A-frame jammer . gin pole . hydraulic lift forks

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
A. Recommend instructor take students to equipment dealers and logging operations to observe the various equipment and methods used in loading. This phase of the module may be accomplished during the field trip recommended for the identification of skidding equipment and methods. Again, if possible, students should observe loading equipment and methods under working conditions.	A. Wherever possible students should be given the opportunity of loading logs and binding them ready to transport to the mill for further processing. They should observe all safety precautions during these practice sessions so this becomes an integral part of their work habits.	A. Demonstrate ability to construct a load correctly of small wood and of logs according to stability, minimum wear on truck, and public law.
	B. Students should read manufacturer's maintenance manuals for equipment to be used while loading logs. They should do actual daily and continuous maintenance on all equipment used. Articles not generally in need of daily maintenance (like tongs, hooks, cables, chain, pulley blocks, etc) should be provided the students in a condition warranting maintenance and should be duly maintained by the students.	

OBJECTIVES BY UNIT	CONTENT
Unit 5 - (continued)	B. Daily and continuous maintenance of loading equipment . Keep all tongs, hooks, etc sharp . Check cable, chain and rope for fraying, cracks, etc . Regular operating maintenance of power equipment as specified in maintenance manuals obtained from manufacturers. . Check pulley blocks for soundness, and proper line hookup. C. Safe and effective operation of loading equipment. . The landing (loading area) . ease of truck entry and exit . space for safe movement by workers . prevent logs from breaking loose from deck . unobstructed view for machine operators . logs not swung over workmen . be observant of logs in hazardous lay and provide a signal man for machine operator . maintain continuous check on condition of all rope, cable, and chain systems and all blocks . booms built of materials of sufficient strength for the loads handled . Loading . remove logs from deck in orderly manner to maintain stable lie of all remaining logs . workers remain positioned off the ends of the logs being loaded . remain alert at all times . wear recommended safety equipment (hard hats, steel toe boots, caulk boots) . fully secure each log with hooks, tongs, slings, etc before moving it . never exceed safe lifting specifications of the weakest part of the loading system . develop and use hand signals while loading . The load . outer logs of a layer that are not secured by stakes or other holding devices should be centered inside of the outer logs on the next lower layer in such a way that the load will be stable without the use of binders . all logs should be securely cradled or saddled . balance the load on the truck bed correctly . use log binders as a precaution to insure load stability . do not overload vehicle . use bunks on flat truck bed to give load stability and save wear on bed . use safety tripping device on truck to unload

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
	C. Stress alertness and constant operation as a key element in good, effective maintenance on the job. D. An important part of planning the loading is the selection of the loading site. Students should be actively included in the naming of several alternative sites (both good and bad) and in the selection of the best sites. E. Students should be given experience in rigging up several loading systems and in operating those systems. They should gain experience in loading small wood by hand, and if possible in "bundles;" logs by hand methods and logs by loading devices. F. Students should have the opportunity to observe all the loading end of a logging operation in the field. This may be accomplished during the field trip recommended for days 7 and 8. G. Stress safe use of equipment H. Stress use of effective hand signals. I. Students should gain experience in building a load of logs and of small wood on a transporting truck that is stable, of proper placement and proportion and that meets legal requirements. J. Students should observe loads built on actual logging operations. K. Stress safe use of equipment.	

MODULE OF INSTRUCTION

Title - OPERATION OF TIMBER HARVESTING EQUIPMENT Code - 01.0703-02

RESOURCE MATERIALS

Books:

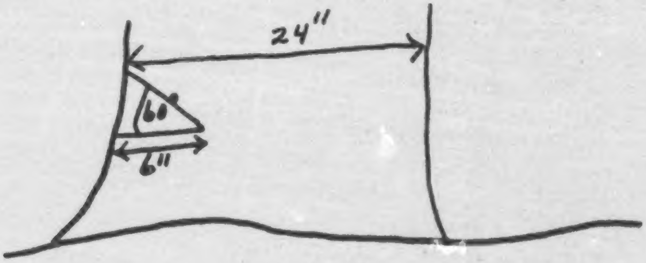
1. Forestry Handbook - R. D. Forbes and A. B. Meyer. The Ronald Press Co., N.Y. 1961. Illus. (purchase from Ben Meadows Co., $15)
2. Rope Knowledge for Riggers - Columbian Rope Co., Auburn, N.Y. 73 pp. Illus.
3. Chainsaw Service Manual - Technical Publications, Inc., 1014 Wyandotte St., Kansas City, Missouri 64105. Copyright p. 66. 216 p. illus.

Bulletins:

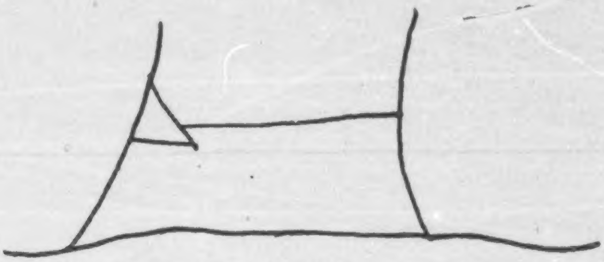
1. Guides for Preparing Forest Product Sales Contracts - New York State Conservation Dept. Division of Lands and Forests. Forest Management Leaflet No. 6. 1966.
2. Logging Farm Wood Crops - Farmers Bulletin No. 2090. U. S. Dept. of Agric. Washington, D. C. 1962. 52 pp. illus.
3. Safety Code for Logging - Industrial Accident Commission, Salem, Oregon 97310 Effective May 15, 1958.
4. Filing A Chainsaw Blade - Donald Brotzman. Available through the Agricultural Education Division of the NYS College of Ag Rural Ed Dept. at Cornell Univ., Ithaca, N.Y.
5. Mechanize Your Farm Woodlot Safely - E. W. Foss and F. E. Winch, Jr. NYS College of Ag, Cornell Extension Bulletin 1109 (10¢) 16 pp. illus.
6. Tree Volume Tables Based on Forest Site-Adirondack and Catskill Regions of NYS - State University of NY, College of Forestry at Syracuse. Bulletin No. 29 (10¢) 8 pp.
7. Measuring Trees and Logs - NYS Dept. of Conservation. Mimeo No. C-25 & 26. Revised 1965. 6 pp. illus.
8. Mechanized Logging in N. Y. - Conservation circular from Fernow Hall, NYS College of Ag, Cornell University. Vol. 6, No. 3. July, 1968. 7 pp.

CHECK LIST FELLER - SKIDDER
CUTTING LOADING OPERATIONS

1. Felling
   - A. Safety hat - shoes (knee guards optional)
     Snug fitting clothes
     No cuffs on trousers
     No extra equipment attached (knives, etc) to belt to catch
     Safety glasses if glasses required
     Clean chain saw
     Wedge
     Axe-single bit
   - B. Clear area around tree for safe operation
     Note direction of lean (a tree can be fitted in three live trims)
     Choose proper felling direction for best skidding operation
     Note any potential hazards overhead
     dry limbs, dead tops, interferring trees or limbs, dead trees
   - C. Determine direction tree should fall
     Make sure no directional hazards like dead limbs or tops to fly back when hit
     Make bottom kerf of undercut at least ¼ of diameter into tree, inner edge of cut a straight line and perpendicular as to direction of fall (with calculations for lean)
     Make upper kerf starting so as to make our approximate 60° angle under cut, having both cuts meet at inner edge



Start cut on backside so that the kerf is even or a little above undercut. This helps prevent kickback prematurely.



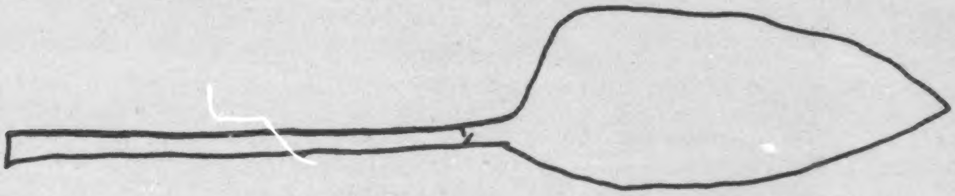
Make cut stop just short of under cut to prevent cut off and random fall. If leaning and you must make a forced directional fall, insert wedge and apply pressure just as soon as possible.

Keep the side of the tree toward which you are drawing the fall the last to be cut in order to hold the direction of fall true.

As cut is nearing completion force tree over with wedge until it will free fall when nearly cut off at stump.

When tree starts fall stop the saw and quickly move to safe position watching the fall. Be alert for unforseen hazards (limb stubs, etc) which may be hurled in your direction.

2. Limbing
    All done with chain saws today. Cut off spur at butt if any.
    Note any spring poles resulting from fall
    Note any limbs under pressure
    Cut any limbs under pressure from inside of bow or outside the arc of release. The same with spring pole.
    Keep any cuttings clear of saw
    Make limb cuts parallel to trunk and flush
    Stay on firm footing
    Cut off top--most always down pressure
    Stand clear--cut top of tree until kerf starts to close. Then cut up from below just ahead of upper kerf.



    When bole falls it won't carry saw down with it
    If softwood, lop the tops (required in Adk.Park)
    Stop saw before moving
    Don't walk with chain saw running

3. Skidding
    Horse skidding
        Hook chokes to tree
        Hook chokes to whiffle tree last
    Drive horse by voice or saws long enough to follow hitch
    Watch for stubs or limbs that hitch can jar off overhead hang-ups
    Keep trail clear
    Mechanical skidding
    Check skidder for fuel and oil
    Check running gear for foul ups
    Secure chokes
    Start machine and warm up
    Check all clearance
    Lead into woods for hitch
    Note dead tree--limb hazards
    If needed--cut before first hitch
    At farthest tree
    Choke and hook to cable
    Skid to meet tree
    Drop first tree
    Pick up second
    Skid second to first
    Hook up first again etc to complete hitch
    Watch cutters and/or helpers at all times when operating
    Arch plan, winch, etc
    Head for skidway
        bad hole, mud, stump, etc
    Drop load on cable; move ahead or to side, winch by obstacle; at skidway
    Drop load
    Unhook exposed choke
    Don't reach down into hitch for choke

C 1 - Proper decking of logs
Proper position of loader--level firm ground
Proper outriggers where needed
Proper swing areas in all directions for booms free from obstructions and falling hazards to operator or helper
3 No logs should extend over ½ its diameter above stake

4. Bucking a tree
   a. Examine tree for end product--posts, logs, pulp, etc.
   b. Make log for cuts
   c. Clean cut path of dirt, stones, etc.
   d. As you come to each cut clear saw path of hazards
   e. Use wedge or undercut to prevent pinching
   f. Watch for pressure on tree to be bucked
   g. Never stand inside the pressure of tree and cut--demonstrate
   h. Develop good judgment on the different products to be saved in multiple use operation
   i. Work safely

5. Proper and safe loading
   a. Know your levers
   b. Watch for people and hazards
   c. Make sure load secure when lifting
   d. Lift carefully, steadily
   e. Never lift over people
   f. Set load into rack carefully to avoid damage to truck or rack
   g. Make sure of proper seating of load in the truck prior to next lift
   h. Make sure of proper spread on rack or bunks
   i. Use proper binders and tie chains

Draw balance of hitch to expose choke--continue until all are hooked.
Free all chokes
Hook up to go back
Shift trees to assist bucks on skidway--freeing for his job
Use extreme care with crooked trees and those with big limbs attached when pushing for bucks at skidway

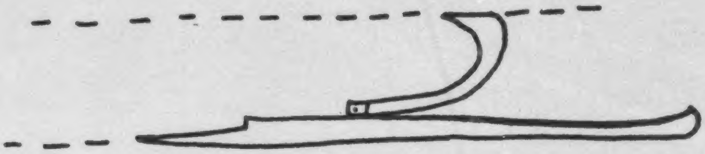
A.P.A. Pulpwood Handbook

1. A. Pulphook

Activities: Instructor learn application and proficient use of each tool

B. Air breathing and filters
Gas--safety in filling (not on hot exhaust)

Dog on Peavey--parallel to pick



C. Emphasis on use of wedge to control directional falling to avoid hang up and blow back. Never cut out hanging tree--pull down with skidder.
Teach safe use of top side of chain saw to cut from underneath limb or fowl under pressure
Avoid pinching of saw in bucking with use of 3 above or wedge

2. A - 1. Use term skidder - "Tree Lamer"

Denotes brand name
Several other types of skidding equipment
"Feller - Bunches"
Harvester
Lonwander, etc.

2. Cable, hook - lead line - free spooler, power - haul back
Safety cab, fair lead - remote winch control

3. Clevis, binder teach students to field tie wire rope
Teach proper attachment to winch drum and teach proper times to replace worn rope

Proper care in skidding trails to remove any falling hazards along trails
Helper alert to skidder cable and tree as it is moved away from whip of broken cable - out of the bite of cable - behind tree or hitch when following skidder
Pulling down hang ups
Unhooking the hitch

3 -A
Crane - Gapple
also under 3

B
Check hydraulic lines and connections for leaks or fraying
Check hydraulic cylinders for leaks
Check all hydraulic reservoirs and use proper fluids
Check all brake systems on drums etc.--keep free of grease and oil proper adjustments
Use clean containers and proper fuels for all motors. Same for lubricating oils
On enclosed cabs--clean and unbroken windows

MODULE OF INSTRUCTION

Title - SCALING AND MARKING TIMBER

Code - 01.0703-03

DESCRIPTION:

This module provides experience for a forest or resource worker in timber marking and in the grading and scaling of timber and logs.

Students will perform field work using log rules, volume tables, and other equipment used in log and tree scaling. Work will include defect deduction in volume calculation.

Field work will include study of log grade determination and visual cull deduction indicators.

Cord wood determinations along with application of other units of measure (i.e.-board foot, piece linear foot, etc.) will be made.

MAJOR DIVISIONS OR UNITS OF CONTENT	Time Allocation Class	Time Allocation Other
1. Cord measurement	2	0
2. Units of measure	2	4
3. Cordwood scaling	1	4
4. Log rules	2	0
5. Volume tables	3	0
6. Scales stick construction	1	2
7. Saw log scaling	0	3
8. Risk tree marking	0	3
9. Limiting D.B.H. marking	0	2
	12	18

Revised February 1974

MODULE OF INSTRUCTION

Title - SCALING AND MARKING TIMBER

Code - 01.0703-03

OBJECTIVES to be obtained:

The student will be able to:

1. Define and calculate 9 of 10 given problems pertaining to the measurement of standard cords, long cords and short cords.
2. Define and demonstrate ability to calculate 9 of 10 situations involving the units of measure a) board foot, b) pieced, c) linear foot.
3. Define and demonstrate ability to calculate situations involving the cord unit of measure. Obtain by scaling the number of standard cords minus avoidable void deduction for a pile of 4 ft. pulpwood to an allowable error of .04 cd/1.00 cd.
4. Graphically illustrate, following prescribed procedures, the inherent differences for the common log rules Scribner, Doyle & International.
5. Demonstrate ability to properly use board foot volume tables when given log rule, form class, log length, D.I.B. or D.B.H. (diameter inside bark) (diameter breast height).
6. Construct a useable tree scale stick and obtain board feet for a series of prescribed trees to an allowable error of 5 bd. ft/1000 bd ft.
7. Gross scale, name and deduct for defects a pile of sawlogs using a scale stick, loggers tape and cull deduction information guide to an allowable error of 5 bd. ft/1000 bd. ft.
8. Identify in the field using a "Poor Risk Tree" information guide, those individuals which could normally be marked in a selection cut and state the reason for selection.
9. Demonstrate on preselected trees ability to use an "Average Limiting D.B.H." guide to determine trees considered financially mature.

Code - 01.0703-03

Title - SCALING AND MARKING TIMBER

OBJECTIVES BY UNIT	CONTENT
Unit 1 - Cord measurement Objective 1 Define and calculate 9 of 10 given graphical problems pertaining to the measurement of standard cords, long cords and short cords.	A. Standard cord . Definition . Calculation . variable piling (i.e. uneven, sloping) B. Long cord . Definition . Calculation . Use C. Short cord . Definition . Calculation . Use D. Contracts . Cubic foot specification . Scale by weight . Minimum diameter specifications
Unit 2 - Units of measure Objective 2 Define and demonstrate ability to calculate 9 of 10 situations involving the units of measure a) board foot, b) piece, c) linear foot.	A. Board foot . Definition . Use and application . Expressed thousands-M-(MBF) . Single board calculations . Pile of assorted lumber calculation . Relation to standing tree B. Piece . Definition . Use C. Linear foot . Definition . Use

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
A. Lecture and discussion. B. Sample study problems made available to students.	A. Student to become familiar with calculations that determine cubic feet of wood, bark and air to determine cord content in various stacks of wood.	A. Students evaluated by calculating cord measure on graphical piles of wood. Pictures display different piling situations (i.e. sloping ground, uneven pile) and different cord lengths (i.e. standard, long, and short cords). Evaluation to instructor's standards.
A. Lecture and discussion. B. Sample study problems made available to students. C. Visitation to lumber yard to view lumber units of sale and calculation of board and lineal feet.	A. Student practices measurement methods and calculation of board feet--lineal feet on lumber of various sizes in preparation for evaluation.	A. Using lumber and piles of lumber of known quantity have students scale for board feet and lineal feet. Evaluation to instructor's standards.

Code - 01.0703-03

AGRICULTURAL

Title - SCALING AND MARKING TIMBER

OBJECTIVES BY UNIT	CONTENT
Unit 3 - Cordwood scaling Objective 3 Define and demonstrate ability to calculate situations involving the cord unit of measure. Obtain by scaling the number of standard cords minus avoidable void deduction for a pile of four foot pulpwood to an allowable error of .04 cd/1.00cd.	A. Measurement factors . Gross and net . Setting allowance . Avoidable voids . Piling variability . Cubic foot conversion B. Scaling equipment . Loggers tape . Rule . Tally sheet . Avoidable void table . Paint gun C. Obtaining measurement . Holding and number method (height) . Length D. Volume calculation . Cordwood volume tables . Mathematical
Unit 4 - Log rules Objective 4 Graphically illustrate, following prescribed procedures, the inherent differences between the common log rules Scribner, Doyle and International; and correctly answer 4 of 5 questions relating to the selection of different log rules under different conditions.	A. Log rules . Definition . Variability B. Commonly used rules . Scribner . . derivation . . characteristics . Doyle . . derivation . . characteristics . International . . derivation . . characteristics

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
A. Field trip to woodlot containing piled pulpwood for discussion and viewing. Instructor demonstrations of scaling, showing examples of void, taking measurements, etc.	A Students pair off and practice pulpwood scaling in preparation for evaluation.	A. Students independently scale piles of pulpwood for evaluation to a standard of an allowable error of .04 cd/1.00 cd.
A. Lecture. B. Visual aid consisting of scale sticks for the three major log rules. C. Graphical lab exercise.	A Students receive printed volume tables for the three log rules. Each will set up 10 sq/inch graph paper and plot the even D.I.B. (diameter inside bark) and their given board foot volumes. Graph will illustrate differences between the log rules.	A. Student evaluated by answering questions based on the graphical evidence, and by evaluation of student's graphical work done (to instructor's standards).

Code - 01.0703-03

Title - SCALING AND MARKING TIMBER

OBJECTIVES BY UNIT	CONTENT
Unit 5 - Volume tables Objective 5 Demonstrate ability to properly use board foot volume tables when given log rule, form class, log length, D.I.B., D.B.H. (diameter breast height).	A. Volume tables . Types . Form class . definition . necessity B. Log length . Trim allowance C. Diameter inside bark (D.I.B.) . Obtainment (two measure) D. Diameter breast height (D.B.H.) . Obtainment . Uses . tree scale . silvicultural application
Unit 6 - Scale stick construction Objective 6 Construct a useable tree scale stick and obtain board foot for a series of prescribed trees. Student should be able to obtain correct D.B.H. and tree height to nearest 1/2 logan 100% of attempts.	A. Tree scale . Need . stand or tree estimation . Obtainment . Abney handlevel and volume table . scale sticks B. Tree height . Cut off point . pulpwood DIB . sawlog DIB . hardwood . conifers C. Scale stick construction . Wood blank . Printed contents D. Scale stick field use . Tree height . Tree D.B.H. . Board foot volume derivation . Tally total note form

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
A. Lecture. B. Student receives volume tables of different Form Class and Log Rules Tables for Estimating Board Foot Volume of Timber U.S.F.S. U.S.D.A., cost 30¢ is suggested. Student participation in obtainment of desired information.	A Student is given a number of logs. Stress variable in size, and uses prescribed form class etc. and looks up volumes.	A Accuracy of answers obtained under student application activity can be evaluated. Instructor require as many example problems as is necessary to achieve satisfactory student performance. Evaluation to instructor's standards.
A. Field application of scale stick lab project (stick construction). B. Discussion (field).	A. Student to construct a scale stick in the shop which he will use in obtaining board foot volumes of standing trees. B. Students will have to utilize knowledge of breaking tree into log length and top estimations for various tree products (i.e. hardwood-softwood sawlogs). C. Student must exercise care in obtaining - . Accurate D.B.H. measure . Accurate distance from tree for height measure . Correct reading of stick in determining tree height in logs . Correct application of D.B.H. and height in obtaining volume . Correct and accurate record-keeping in the field.	A. Student will be evaluated by his ability to obtain gross volume for a series of trees. Correct measurement of tree D.B.H. and height in logs should be standard for evaluation. B. Deductions in student grade for less than perfect scaling is left to instructor's discretion.

Code - 01.0703-03

Title - SCALING AND MARKING TIMBER

OBJECTIVES BY UNIT	CONTENT
Unit 7 - Saw log scaling Objective 7 Obtain gross scale - specify and deduct for defect to obtain net scale of individual logs using a scale stick, logger's tape, and cull deduction information guide to an allowable error of 5 bd. ft/ 1000 bd. ft.	A. Deck scaling . Definition . Species determination . Log cleanliness . Log piling B. Equipment . Scale stick . Loggers tape . Marking ax, crayon, etc. . Safety equipment C. Log grades . Hardwood factory lumber log grades . Pine grades (K count) . Application of grade D. Scaling for defect . "Boxing out" formula . Defect types . butt rot . mechanical damage . seams . checking . miscellaneous, etc. E. Tree grading equipment . Diameter tape . Marking pole . Sounding ax . Field references

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
A. Field application of using scale stick in deck scaling.	A. Students visit log yard and participate in log scaling exercise. Tally is kept and a volume summary with defect type noted.	
B. Lecture and demonstration.	B. Students will observe defect on standing trees viewing sporiferous of various rot causing fungi. They will grade 2 trees following instructional aids and demonstration Diameter tapes, increment borers, sounding ax and marked pole will be used following the "2nd best face method."	
C. Instructional handouts showing sample defect deduction problems. Instructional aids in hardwood log grade defects and field participation.		

Code - 01.0703-03

Title - SCALING AND MARKING TIMBER

OBJECTIVES BY UNIT	CONTENT
Unit 8 - Risk tree marking Objective 8 Identify in the field using a "Poor risk tree" information guide those individuals which could normally be marked in a selection cut and state the reason for selection.	A. Poor Risk Tree . Definition . Types (see Guides for reproduction cuts) B. Objectivity of choice C. Retention of stocking basal area by sizeclass D. Use of field guides
Unit 9 - Limiting D.B.H. Objective 9 Demonstrate on preselected trees ability to use an "Average Limiting D.B.H." guide to determine trees considered financially mature.	A. Average limiting diameter . Definition . Application B. Financial maturity C. Selection cuttings

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
A. Instructional aid information sheets. B. Field trip into all age hardwood stand desirable. C. Discussion and student participation.	A. Student using instructional aid will identify type and number of poor risk trees on a prescribed plot. They will tally, state tree number and type of poor risk individual.	A. Evaluate student ability to classify a given tree as to whether or not it can be considered a "poor risk tree" and his ability to verbally support his decision. B. Evaluate student ability to accurately tally poor risk trees by species, risk type, and number for a given forest plot. Evaluation to instructor's standards.
A. Instructional aid information sheets. B. Field trip to all age hardwood stand desirable. C. Student application and discussion.	A. Students use guides in a hardwood stand to determine the potential maturity of preselected trees of various species.	A. Determination of answer correctness used to evaluate objective.

MODULE OF INSTRUCTION

Title - SCALING AND MARKING TIMBER Code - 01.0703-03

RESOURCE MATERIALS

Books -

1. Forestry Handbook. Edited by Reginald D. Forbes for the Society of American Foresters, The Ronald Press Co.: New York 1961. Chapter I. illus. (approx.$15.00) (available through Ben Meadows Catalog).

Bulletins -

1. "Measuring & Marketing Farm Timber." USDA Farmer's Bulletin #1210. Revised October 1955. Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. (15¢), 33pp. illus.
2. "Measuring Trees & Logs." New York State College of Agriculture at Cornell University, Ithaca, N.Y. Revised by Alex Dickson, Extension Forester, October 1965, 6pp. illus.
3. Tables for estimating board-foot volume of timber U.S.F.S. USDA Government Printing Office, Washington, D.C.

1. GUIDES FOR MARKING TREES

Seed Tree
Shelterweed "Selection"

OBJECTIVE #3

Selection
System

GUIDES FOR REPRODUCTION CUTTINGS
Variable by location & site

The condition of the stands will dictate the cutting method to be used. The trees to be marked will be selected by applying the following guides. As much desirable growing stock as possible should be left and adequate protection for the residuals should be provided. If stand conditions permit, at least 80 square feet of basal area per acre should be retained. (with proper size classes)

The following tentative limiting diameters for high quality low risk trees are established and will require adjustments depending on sites. Trees above these diameters will usually be considered as poor risk. Ordinarily a tree below the limiting diameters will be a good risk unless it is rendered undesirable by defect or disease. These diameters, however, are average, and the marker, on the basis of his knowledge and judgement of individual tree conditions, is authorized to deviate from these diameters. In some cases it will be desirable to leave poor-risk trees in order to afford protection from wind or exposure to one or more good-risk trees.

Form Class Converting o/o for cruising with height vol. tables-

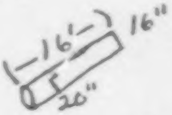
	Species	Average Limiting DBH
97	Red Spruce	18
86	Balsam fir-B.Spruce	8
86	Hemlock	18
97	Red pine	20
97	White pine	22-26
100	Beech	16
92	Yellow Birch	18
89	Sugar Maple	22-24
92	Paper Birch	10 or 8
92	Aspen	8
89	Red Maple	16
92	White Ash	18
93	Jack Pine	8

Keep in Mind
That you can cut below this if they are poor risk trees or if the type of cut is for other than selection which is Removal of mature timber as single trees or small groups repeated at short intervals to give continuous reproduction.

Form Class= % ratio between top D.I.B.and D.O.B. at D.B.H. for the 1st 16 ft.log.

F.C.= $\frac{16}{20}$

FC= 80%



POOR RISK TREES

The following will be marked:

1. Dead trees (if market exists).

2. Dying trees.

3. Disease and insect infested trees where sanitation dictates their removal.

4. Hardwood trees having more than 25% of the major limbs dead or broken off at or near the trunk.

5. Trees having more than 50% of the crown area dead,broken or missing.

6. Trees having basal wounds so deep that the tree is in danger of breaking off.

7. Trees having conks, cankers, leaky knots, holes or large swellings on the bole or within 8 feet of the merchantable top, except that trees having conks or poria oblique in any location will be marked.

8. Trees having porcupine or other injuries encircling the trunk

9. Yellow birch and paper birch trees that are materially exposed on the south and west sides.

10. Trees too limby to produce value increment.

11. Trees that are tilted with roots exposed or liable to wind throw.

12. Trees such as spruce, that are not wind firm if left in an exposed condition.

13. Trees with tops broken off or dead at a point where the stem is over 5" in diameter, provided such point is within 16' of the utilizable top.

14. Forked trees showing indications of splitting within the usable sawlog portion of the stem.

15. Balsam fir over 50 years old.

16. Paper birch over 60 years old.

17. Aspen over 60 years old.

If condition of the stand is such that basal area per acre is in excess of 80 square feet after poor-risk trees have been removed, the following priority of cutting should be used.

1. Defective trees of less desirable species where rotten cull exceeds 10%.

2. Poorly formed, crooked, or forked trees of less desirable species.

3. Defective trees of most desirable species where rotten cull exceeds 10%.

4. Trees of low vigor having small, overtopped crowns with poor coloration.

5. Poorly formed, crooked or forked trees of most desirable species.

6. Trees of fair vigor, usually dominant or co-dominant, having fair sized crowns.

7. Trees of good vigor, dominant or co-dominant, having large crowns with good coloration and other indications of good health.

DIAMETER OF TREE, OUTSIDE BARK
4½ FEET ABOVE GROUND (in inches) →
(Hold stick 25 inches from eye against tree)

Tree Volume Doyle Scale	1 16-Foot Log (Bd. Ft.)
	2 16-Foot Log (Bd. Ft.)
Inches → 2	4

Cut out cruising stick and staple or glue to a lath, p

16	18	20	22
74	104	139	180
119	171	233	305
12	14		16

6	8	10	12	14
		15	[illegible]	50
		21	45	70
6		8	10	

lywood strip, etc. Apply clear shellac or varnish for protection.

24	26	28	30
225	272	328	388
336	471	571	680
	18		20

TREE AND LOG MEASURING SCALE

Extension Forestry
N.Y.S. College of Agriculture
Cornell University, Ithaca, N. Y.

22

SOMETHING CALLED HERITAGE

What's in a forest? There are trees and a great deal more. There are streams, and soil, and wildlife. And there's still something else--a very special something that doesn't have leaves or needles, that won't grow anything, that won't quench a thirst, or that won't take a fishing line or provide a hiding place for wildlife.

It's HERITAGE--something which our American land and our forefathers gave you to hold in trust.

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0 DIAMETER OF TREE FOR AN ARM REACH OF 23 INCHES 5 7

TO OBTAIN THE TREE DIAMETER.
(1) Hold stick horizontally, at arm's reach, against tree at breast he
(2) Without moving your head, look at the other side of tree and rea
(3) That figure is the estimated tree diameter at breast height. Writ

NUMBER OF 16-FOOT LOGS at 66 feet from tree

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0 DIAMETER OF TREE FOR AN ARM REACH OF 24 INCHES 5 7

TO OBTAIN THE TREE DIAMETER:
(1) Hold stick horizontally, at arm's reach, against tree at breast h
(2) Without moving your head, look at the other side of tree and rea
(3) That figure is the estimated tree diameter at breast height. Writ

NUMBER OF 16-FOOT LOGS at 66 feet from tree

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0 DIAMETER OF TREE FOR AN ARM REACH OF 25 INCHES 5 7

TO OBTAIN THE TREE DIAMETER:
(1) Hold stick horizontally, at arm's reach, against tree at breast he
(2) Without moving your head, look at the other side of tree and rea
(3) That figure is the estimated tree diameter at breast height. Writ

NUMBER OF 16-FOOT LOGS at 66 feet from tree

INSTRUCTIONS FOR MAKING BILTMORE STICK: (1) Buy from a lumber dealer, a slat 1¼"x 1/4"x 36". (2) Hold slat in your hand and fully extend your arm out horizontally. Use a yardstick to measure distance from your eye to the slat. That is

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With the heritage of the forest goes a great responsibility. You
a pass it on to future generations of Americans. Each of us must do
make sure that the resources are used so that the needs of our
ow, and for all time.

Your teacher, your State Forester, and the professional foresters
s responsibility and will help you understand how good forest man-
trengthen America's heritage. Ask them.

This is a Biltmore Stick. It is one of several tools the forester
asure the amount of lumber in a tree.

Take this Biltmore Stick into a forest and learn
trees. But learn and see something more. See the trees of the forest
of our future homes, schools, and churches. And ask yourself how y
help to make sure your forests are wisely used.

This is an invitation to an adventure that will
challenge your curiosity and concern!

Edward P. C

EDWARD P. CLIFF, Chief, Forest Service U.S. Department

9 11 13 15 17 19

reast height (4½ feet above ground); line up zero end with outside of tree.
and read figure nearest to where your line of sight crosses the stick.
ght. Write it down for later use in getting tree volume.

2

With the heritage of the forest goes a great responsibility. You
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7 9 11 13 15 17

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ght. Write it down for later use in getting tree volume.

2

ur "arm reach", and it will probably be between 23 and 25 inches. (3) Select
mple the arm reach nearest to your own arm reach. Cut it out and glue it
on (be sure left end of template is exactly at the left end of the slat).

Cut out the template which has a
Forest Service and glue it on the other
Biltmore Stick, transfer the divisions

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TO OBTAIN NUMBER OF BOARD FEET IN TREE:

(1) Find column headed by the tree diameter that you have estimated.
(2) Find line with number of logs you estimated.
(3) Read the number where the column and line intersects. This is the board-foot volume of the tree.
For example: a 12-inch, 1½ log tree has 78 board feet.

DIAMETER:		10	11
NUMBER OF SAWLOGS	1	39	4
	1½	51	64
	2	63	
	2½	72	
	3	--	
	3½	--	
	4	--	

21 23 25 27 29 31 33 35

ONLY YOU CAN

TO OBTAIN THE NUMBER OF LOGS IN THE TREE:

(1) Stand 66 feet from tree; hold arm out horizontally and the stick vertica
(2) Slide stick up or down until top of stick is in line with an estimated to
(3) Without moving your head, sight to bottom of tree (be sure stick is still
(4) The nearest figure is the number of 16-foot sawlogs in the tree. (Forester
(5) Write down the number of logs next to the written diameter and look up th

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(1) Find column headed by the tree diameter that you have estimated.
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(3) Read the number where the column and line intersects. This is the board-foot volume of the tree.
For example: a 12-inch, 1½ log tree has 78 board feet.

DIAMETER: 10 11
NUMBER OF SAWLOGS 1 39 4 · 1½ 51 64 · 2 63 8 · 2½ 72 9 · 3 -- -- · 3½ -- -- · 4 -- --

21 23 25 27 29 31 33 35

TO OBTAIN THE NUMBER OF LOGS IN THE TREE:

(1) Stand 66 feet from tree; hold arm out horizontally and the stick vertically
(2) Slide stick up or down until top of stick is in line with an estimated top di
(3) Without moving your head, sight to bottom of tree (be sure stick is still ve
(4) The nearest figure is the number of 16-foot sawlogs in the tree. (Foresters
(5) Write down the number of logs next to the written diameter and look up the

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For example: a 12-inch, 1½ log tree has 78 board feet.

DIAMETER: 10
NUMBER OF SAWLOGS 1 39 · 1½ 51 · 2 63 · 2½ 72 · 3 -- · 3½ -- · 4 --

21 23 25 27 29 31 33 3

TO OBTAIN THE NUMBER OF LOGS IN THE TREE:

(1) Stand 66 feet from tree; hold arm out horizontally and the stick vertically
(2) Slide stick up or down until top of stick is in line with an estimated top
(3) Without moving your head, sight to bottom of tree (be sure stick is still v
(4) The nearest figure is the number of 16-foot sawlogs in the tree. (Forester
(5) Write down the number of logs next to the written diameter and look up the

3

ou from the Chief of [illegible]
he slat. (4) For a more durable
rs to a hardwood stick of same

size, and carve them with a scout knife or woodburner. Give stick 2 coats of "outside" clear varnish. (5) Give the other templates to other scouts in your home troop.

10	11	12	13	14	16	18	20	22	24	26	28	30	32	34	36	38	40
39	4	59	71	83	110	140	180	220	270	320	370	420	480	550	620	690	770
51	6	78	96	112	150	200	250	300	370	440	510	590	680	770	870	970	1090
63		98	120	141	190	250	310	390	470	560	650	760	870	990	1120	1260	1400
72		112	138	164	220	290	370	460	560	660	780	900	1040	1190	1350	1510	1690
--		127	156	186	260	340	430	530	640	770	900	1050	1210	1380	1570	1770	1950
--		--	---	201	280	370	470	580	710	850	1000	1160	1350	1540	1750	1970	2200
--		--	---	---	300	400	510	640	770	930	1100	1270	1480	1690	1920	2170	2430

3'5 7 3'9 4'1

ck vertica. arm's reach.
stimated to meter of 8 inches or where tree becomes very limby.
ick is still. cal) and see place on stick where your line of sight crosses it.
ee. (Forester estimate number of logs above a 1-foot stump.)
nd look up th. corresponding number of board feet in the volume table.

10	11	12	13	14	16	18	20	22	24	26	28	30	32	34	36	38	40
39	49	59	71	83	110	140	180	220	270	320	370	420	480	550	620	690	770
51	64	78	96	112	150	200	250	300	370	440	510	590	680	770	870	970	1090
63	80	98	120	141	190	250	310	390	470	560	650	760	870	990	1120	1260	1400
72	92	112	138	164	220	290	370	460	560	660	780	900	1040	1190	1350	1510	1690
--	--	127	156	186	260	340	430	530	640	770	900	1050	1210	1380	1570	1770	1980
--	--	---	---	201	280	370	470	580	710	850	1000	1160	1350	1540	1750	1970	2200
--	--	---	---	---	300	400	510	640	770	930	1100	1270	1480	1690	1920	2170	2430

3'5 3'7 3'9 4'1

ck vertically at arm's reach.
timated top diameter of 8 inches or where tree becomes very limby.
ck is still vertical) and see place on stick where your line of sight crosses it.
(Foresters estimate number of logs above a 1-foot stump.)
d look up the corresponding number of board feet in the volume table.

FR:	10	11	12	13	14	16	18	20	22	24	26	28	30	32	34	36	38	40
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	63	80	98	120	141	190	250	310	390	470	560	650	760	870	990	1120	1260	1400
	72	92	112	138	164	220	290	370	460	560	660	780	900	1040	1190	1350	1510	1690
	--	--	127	156	186	260	340	430	530	640	770	900	1050	1210	1380	1570	1770	1960
	--	--	---	---	201	280	370	470	580	710	850	1000	1160	1350	1540	1750	1970	2200
	--	--	---	---	---	300	400	510	640	770	930	1100	1270	1480	1690	1920	2170	2430

3'5 3'7 3'9 4'1

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stick is still vertical) and see place on stick where your line of sight crosses it.
tree. (Foresters estimate number of logs above a 1-foot stump.)
and look up the corresponding number of board feet in the volume table.

21

MODULE OF INSTRUCTION

Title - TIMBER AND LOG CONVERSION

Code - 01.0703-04

DESCRIPTION:

Students will assist in the planning and layout of a sawmill. They will study and perform millwrighting operations. Students will understand principles and procedures of grading logs and lumber. They will tally, scale and grade logs and saw timber. Students will participate in conversion of saw logs to lumber, performing the operations of edging, trimming, piling and marketing of the product. Students will study and investigate many of the career opportunities in the forest industries.

MAJOR DIVISIONS OR UNITS OF CONTENT	Time Allocation	
	Class	Other
1. Grading and scaling logs	1	1
2. Planning and layout of mill	2	2
3. Millwrighting procedures	2	4
4. Operating mill (headsaw,edger,trimmer)	1	4
5. Edging and trimming	1	4
6. Tailing procedures-piling waste	0	2
7. Grading and tallying lumber and marketing product	2	2
8. Studying occupational opportunities and understanding forest industries	1	1
	10	20

Revised February, 1974

MODULE OF INSTRUCTION

Title - TIMBER AND LOG CONVERSION   Code - 01.0703-04

OBJECTIVES to be obtained:

The student will be able to:

1. Grade at least ten logs with tolerances of under one grade at discretion of the instructor or other resource person.

2. Calculate and tally the estimated volume of at least ten logs using an accepted scale. Allowances for volume of crook, sweep, rot and taper must be calculated and a discrepency of 10% - 15% will be allowable at discretion of instructor.

3. Assist instructor and resource persons in planning of a mill. A drawing will be done with appraisal of instructor.

4. Trouble shoot the mill by performing accepted millwrighting procedures of lead, carriage adjustments, saw set, alignment and saw care with evaluation by instructor.

5. Students selected by instructor will operate the head saw and cut at least three logs. They will be cut by accepted procedures of safety and efficiency as determined by the instructor or resource person.

6. Perform tailing operations of edging and trimming to obtain best grade and volume as determined by log quality and set up by standard grading systems. Evaluation will be based upon interpretation of grading by instructor.

7. Grade lumber using simplified grading rules for softwoods and hardwoods under appraisal of instructor.

8. Pick one hundred board feet lumber using accepted methods for proper drying acceptable by instructor.

9. Create markets, price and sell products under supervision of advisor of Future Conservationists Club. Records will be kept on this project.

10. Review job opportunities in forest industries and demonstrate an understanding by oral or written report to the instructor.

Code - 01.0703-04

AGRICULTURAL

Title - TIMBER AND LOG CONVERSION

OBJECTIVES BY UNIT	CONTENT
Unit 1 - Grading Logs Objective 1 Students will be able to grade at least ten logs with tolerances of under one grade at discretion of the instructor or other resource person. Objective 2 Students will be able to calculate and tally the estimated volume of at least ten logs using an accepted scale. Allowances for volume of crook, sweep, rot and taper must be calculated and a discrepency of 10% -15% will be allowable at discretion of instructor.	A. Understanding Log Grading and Estimating Procedures . Log rules . kinds . use . volume defect calculation . Grade of Logs . major grades . local grades . poorest log concept . uses of classes . grade defects . practical application of grade
Unit 2 - Planning Layout of Mill Objective 3 Students will assist instructor and resource persons in planning of a mill. A drawing will be done with appraisal of instructor.	A. Setting Up the Yard Area . Space . Soil . Access B. Buildings . Material . Size . Arrangement . Machinery . Material Handling C. Plant Location . Power . Supply and Material . Zoning
Unit 3 - Figuring and Analyzing Problems in Mill Operations and Sawing Objective 4 Students will trouble shoot the mill by performing accepted millwrighting procedures of lead, carriage adjustments, saw set, alignment and saw care with evaluation by instructor.	A. Knowing Parts of a Mill . Husk and frame . Mandrel and blade . Luppins . Collars . Carriage . Set works . Dogs . Guides . Feedworks . Rolls and spreaders . Trim and cut off saws . Safety equipment

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
A. Discussion B. Chart (samples) C. Log samples D. Use log rules E. Use tally books F. Assign reading G. Tally and grade ten logs	A. To handle logs on a skidway B. To use logs C. To calculate estimated board feet in log D. To arrive at grade of logs E. To figure defect--both volume and grade F. First the principles,concepts and terms will be reviewed then demonstration of procedure will follow.Students then will spend rest of time actually grading and scaling logs.	A. Using a load of logs students will grade 10 logs to a tolerance of one grade. B. Using a load of logs students will estimate the volume of the load to within 10% accuracy.
A. Discussion B. Field trip C. Slides D. Draw up and design own mill E. Layout building needed F. Figuring equipment and machinery G. Using resource person	A. To set up and plan a mill layout B. To select equipment and machinery needed in mill C. To determine efficient, safe work areas D. Discussion of principles will need to take place followed by field trip to a mill that has efficient set up. E. Students will then draw up floor plans and set plans for actual mill location	A. Evaluate to working drawings done by the student in laying out a mill and his oral knowledge of how the mill will operate.
A. Discussion B. Slides C. Charts and handouts D. Diagram and graphs E. Demonstrations F. Reference material G. Work with mill	A. To identify parts of a mill B. To select proper RPM-HP-and feed speed C. To develop safety habits D. To understand simplified millwright procedures E. Slides and a discussion of mill parts will be presented followed by actual observation of the parts on a real mill.Students will be presented a handout sketch of a mill and will label parts for future study.A practice saw mill will be furnished to swedge and file teeth.	A. Orally explain the adjustment necessary for smooth and safe mill operation

OBJECTIVES BY UNIT	CONTENT
Unit 3 Objective 4 (continued)	B. Adjusting Works . Lead and saw plumb . Feed speed . RPM/HP/Teeth . Levelness and alignment . Saw teeth . Placement of safety devices
Unit 4 - Converting Logs to Lumber Objective 5 Students selected by instructor will operate the head saw and cut at least three logs. They will be cut by accepted procedures of safety and efficiency as determined by the instructor or resource person.	A. Sawing Principles and Practices . Positioning logs on carriage for best use and grade . Taper sawing . Turning logs safely . Safety techniques . Developing feel and sound detection in mill working

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
A. Discussion B. Slides C. Demonstration D. Lumber grading techniques E. Field Trip F. Practice	A. To understand correct procedure in converting log to lumber B. To be able to saw log for best grade volume C. To work safely around mill and yard D. To be able to handle logs properly with cants E. A discussion of proper procedures and demonstration of proper log handling, a sawing will be presented, followed by student participation and practice. Students will be broken up into small groups. F. A field trip to an actual efficient mill will be done here to observe actual practices	A. Evaluation will be based on correct and safe operation of mill

OBJECTIVES BY UNIT	CONTENT
Unit 5 - Tailing Operations, Edging Boards, Trimming Boards and Disposing of Wastes Objective 6 Students will perform tailing operations of edging and trimming to obtain best grade and volume as determined by log quality, and set up by standard grading systems. Evaluation will be based upon interpretation of grading by instructor.	A. Edging . Handling lumber safely off headsaw . Correct positioning of boards in edger . Setting for maximum grade and volume . Running boards through and tailing B. Trimming . Type and use for boards . Safety and equipment use . Quality product C. Waste Handling . Uses and salvage . Pollution and waste D. Piling Lumber . Drying-Sticking-Air Movement . Quality . Uses . Tallying and grading rough lumber
Objective 7 Students will grade lumber using simplified grading rules for softwoods and hardwoods under appraisal of instructor.	
Objective 8 Students will pick one hundred board feet lumber using accepted methods for proper drying acceptable by instructor.	

EDUCATION

01.0703-04 - Code

TIMBER AND LOG CONVERSION - Title

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
A. Demonstrating Techniques B. Diagrams C. Handouts D. Practice E. Grading F. Slides	A. To edge slab boards B. To scale and tally rough lumber C. To use surface measure rules D. To trim rough lumber E. To dispose of waste material F. To pile and stick lumber G. To grade rough lumber H. To practice safety in tailing operations I. To properly dry lumber J. To work efficiently and effectively in lumber handling K. To identify quality work and product L. Demonstrations and discussions will be presented followed by student participation in the various operations.There will be small group activities with one group responsible for edging,grading,tailing, trimming,piling,tallying and grading while one group uses headsaw. M. Sketches and diagrams will be presented with grade cards and tally books in conjunction with board rules.	A. Evaluation will be based on the correct and safe demonstration of mill equipment. B. Demonstrate at mill site the ability to grade lumber to industrial standards. C. Demonstrate at the mill or field site the proper methods of drying lumber.

OBJECTIVES BY UNIT	CONTENT
Unit 6 - Studying Various Career Opportunities in Primary and Secondary Lumbering Industry Objective 9 Students will create markets, price and sell products under supervision of advisor of Future Conservationists Club. Records will be kept on this project. Objective 10 Students will review job opportunities in forest industries and demonstrate an understanding by oral or written report to the instructor.	A. What are Forest Industries . Locally . State and National . Future B. What Jobs are Available . Grading . Sawing and Mill Work . Yard Work . Equipment Operation C. What Further Training is Required . Technical Skills . Experience . Professional Training

EDUCATION

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TIMBER AND LOG CONVERSION - Title

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
A. Discussion B. Oral Topic C. Written Assignment D. Resource Person E. Resource Material F. Guidance G. Field Trips H. Slides	A. We will discuss and observe various areas in field as we actually work in them. Students with special aptitude in certain areas will investigate further possibilities. Guidance persons will be involved to present areas of training and employment. While on field trips persons in the industry will be consulted as to employment possibilities for students. B. To understand forest industries C. To appreciate job opportunities D. To plan career in field E. To know where to get training	A. Evaluation will be based on the final student product of the marketing, pricing and records kept. B. Orally list the job opportunities in the forest industry that have been reviewed in class.

MODULE OF INSTRUCTION

Title - TIMBER AND LOG CONVERSION Code - 01.0703-04

RESOURCE MATERIALS

Books:

1. Forestry Handbook - Forbes, N.Y. Ronald Press
2. Pulpwood Products - W. S. Bromley, Interstate, Dansville, Ill.
3. Small Sawmill Operation Manual - U.S.D.A. Forest Service Handbook, No. 27
4. Forests and Forestry - 1970, 357 pp., Andersen & Smith, Interstate, Dansville, Ill.

Bulletins:

1. The Wide Bandsaw
2. The Efficient Sawmill - Simonds Saw and Steel, Fitchburg, Mass.
3. Manual of Woodcutting Tools
4. The Timber Resources of N. Y. - U.S.D.A. Forest Service Bulletin NE. 20
5. A Guide to Hardwood by Grading - U.S.D.A., Forest Experiment Station Upper Darby
6. Air Drying Lumber in a Forklift Yard
   Simplified Procedures for developing Grade Lumber for Hardwood Logs - U.S.D.A. Forest Service Research Notes No. FPL 0290, Madison Wis. No. PFL 098
7. Forest Industry Opportunities in Rural Development - U.S.D.A. Forest Service No. 222
8. Millwrighting - U.S.D.A. Forest Service, Southwestern Experiment Station Report No. 11
9. Directory of Primary Wood Uses Plants in N.Y. - N.Y.S. Department of Commerce, Albany, N.Y.
10. Directory of Secondary Wood Using Industries in N.Y. - N.Y.S. Department of Commerce, Albany, N.Y.
11. Hardwood Lumber Grading - U.S.D.A. Forest Service, Walton R. Smith, Ashville,N.C.
12. Careers in Forestry - U.S. Dept of Agriculture Forest Service, Publication 249

Periodicals:

1. Northern Loggers Magazine - Boonville, N.Y.
2. Marketing Bulletin - Syracuse University College of Forestry, Prof.Russell Deckert

Audio Visuals:

1. Slide Series on Sawmill Operation - Cornell University College of Agriculture

MODULE OF INSTRUCTION

Title - CHRISTMAS TREE PRODUCTION AND MARKETING   Code - 01.0706-01

DESCRIPTION:

This module goes through the complete cycle of Christmas tree production from ordering the trees to harvesting and marketing. Students will be planting trees they themselves have ordered. They will heel in trees to hold them for planting, plant trees, prune more mature trees to shape them, and cut them for sale. They will learn how to color trees in areas where there is a demand, establish a price for each tree and set the trees up for retail sale.

The units within the module should, by their nature, be taught at different times of the year. A recommendation is: that objectives numbered 1-6 on plantation development be taught during spring planting for a period of approximately 3-5 days; that number 7 on plantation improvement practices be taught in June for a period of approximately 3-5 days; and that objectives 8-10 on harvesting and marketing be taught in December for a period of approximately 2-3 weeks. For an instructor handling his own scheduling this recommendation may be relatively simple. Instructors trying to schedule their program in cooperation with several other instructors and programs may have to make special arrangements satisfactory to their particular situation.

MAJOR DIVISIONS OR UNITS OF CONTENT	Time Allocations	
	Class	Other
1. Plantation Development	1	9
2. Plantation Improvement and Maintenance Practices	2	8
3. Harvesting and Marketing	1	9
	4	26

Revised June, 1974

MODULE OF INSTRUCTION

Title - CHRISTMAS TREE PRODUCTION AND MARKETING Code - 01.0706-01

OBJECTIVES to be obtained: The student will be able to:

1. Conduct an accurate analysis of site conditions pertinent to silvical and economic factors of importance to a Christmas tree operation.

2. Effectively utilize information obtained through site analysis in defining:
   a. the selection of planting stock by species, age, source, seedling or transplant
   b. the design of the plantation layout w/ respect to species and age distributions, working space for maintenance equipment, windbreaks, fencing, etc., and the prescription of measures necessary for proper site preparation and/or fertilization before or during planting.

3. Correctly order seedlings and/or transplant stock from public or private nurserys using order form blanks, and complete agreements w/ landowners for custom planting.

4. Properly handle received planting stock in terms of: a) inspecting for damaged or otherwise unhealthy stock; and b) storing or heeling in - with the objective of having an adequate number of healthy stock of right species, size, and age classes ready for planting at the proper time.

5. Properly handle and plant by hand (in two man teams) approximately 100 trees/hour (400-600 trees/day) to instructor's standards regarding: a)safety, b)line straightness and spacing to within one foot error at all times, and c) seedling survival probability.

6. Safely, effectively, and efficiently maintain and operate wheel and/or crawler tractors with planting attachments in the planting of trees.

7. Safely, effectively, and efficiently conduct all normal stand and tree improvement and maintenance practices including: a) restricting animal and public damage in plantation; b) recognizing presence of common plantation pests and prescribing and carrying out preventative or control measures; and c) pruning and shaping to instructor's standards of quality at a rate averaging one foot of tree height every 15 seconds (allowing additional time for travel and equipment maintenance and rest).

8. Effectively transact business arrangements w/ christmas tree producers, specify and tag desired trees by species, size, and grade, and color trees (if locally feasible) to suit market.

Title - CHRISTMAS TREE PRODUCTION AND MARKETING Code - 01.0706-01

OBJECTIVES to be obtained: (continued - page 2)

9. Effectively and safely conduct a harvesting operation including the selection, marking, cutting, dragging, butting, bundling, and loading of trees to instructor's standards of work rate and quality given existing terrain conditions.

10. Safely and effectively carry out a Christmas tree sales project including: procurement, storage, and exhibiting of trees, dealing with customers, cash receipts, and financial records, and inventory and storage of sales lot equipment.

Code - 01.0706-01

AGRICULTURAL

Title - CHRISTMAS TREE PRODUCTION AND MARKETING

OBJECTIVES BY UNIT	CONTENT
Unit 1: Plantation Development Obj. 1. Conduct an accurate analysis of site conditions pertinent to silvical and economic factors of importance to a Christmas tree operation.	A. Factors of silvical importance . Soil drainage . Soil depth (especially w/ regard to available moisture) . Soil fertility . Aspect . Timing of frosts . Prevalence of insect, disease and animal pests; fire hazard and theft and damage from human activity. . Wind directions (prevailing & storm) . Presence or absence of natural windbreaks . Slope . Elevation . Prevalence of flooding
	B. Factors of economic importance . Access to main roads . Location w/ respect to market . Land costs (purchase or lease) . Land taxes & insurance rates . Soil & terrain conditions w/ respect to road construction & maintenance . Potential and/or existing land uses . Soundness of all legal contracts or land titles pertaining to site. . Terrain w/ respect to planting costs.
Obj.2. The student will be able to effectively utilize information obtained through site analysis in defining: . The selection of planting stock by species, age, source, seedlings or transplant stock. . The design of the plantation layout w/ respect to species and age distributions, working space for maintenance equipment, windbreaks, fencing, etc, and the prescription of measures necessary for proper site preparation and/or fertilization before or during planting.	A. Utilizing any one of many texts & bulletins describing the silvical characteristics & site requirements of common Christmas tree species, select species best suited silvically & economically to plantation site. Use supporting data obtained in site analysis. Utilize personal experience and/or that of area Christmas tree operations in specifying age and source of planting stock, as well as whether to use seedling or transplant stock. B. Providing a written and mapped or sketched design proposal for the layout of a Christmas tree plantation on a given site specifying: . Individual planting plots by: . size . spacing . location . preplanting site preparation . species . fertilization prescriptions . age . Provision for windbreaks " " fire " " " roads & turnaround spaces " " fencing

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CHRISTMAS TREE PRODUCTION AND MARKETING - Title

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
(Reference 6:4-5,1: 7-8) Field lecture to describe thought processes involved in analyzing &/or putting a value on each factor as it is represented on a given site. Demonstration to show organized approach to categorizing a site, in writing, as to its suitability and character for Christmas tree production. (Ref.6:4-5, 1:7-8) Demonstration of use of analytical tools: landjudging cards soil fertility/ph testing equip soil pits climatic records state & local pest reports "reading the land" maps (road & topographical) county clerk's office county treasurer's office utilization of lawyer's services student work experience in carrying out a site analysis.	During and following instructor's field lecture and demonstrations, students are free to ask questions and discuss concepts of site analysis. Students to individually conduct a site analysis on a plot of given boundaries (specified by instructor) and submit proof of accurate and adequate notation on all pertinent factors as they pertain to that plot.	Student to have submitted an accurate and adequate analysis for each factor of silvical and economic importance in field note form-ie. on a "score" card or equivalent.
(Ref.6:4-12) Demonstration A. By handout demonstrating step-by-step development of a written & pictorial description of a plantation layout plan. Include analysis factors and resulting decisions leading to the plan &/or B. By instructor lecture on same material, w/ student discussion & questions handled. (Ref.6:4-16) Work Experience Individual student preparation of written & pictorial plan for planting schedule & plant layout.	Students prepare for exercise by reading handout materials &/or observing instructor's lecture-demonstration & in asking questions & discussing concepts pertinent to the objective.	Instructor evaluation of accuracy & completeness of individual's submitted planting schedule & plantation layouts.

Code - 01.0706-01

Title - CHRISTMAS TREE PRODUCTION AND MARKETING

OBJECTIVES BY UNIT	CONTENT
Obj.3. The student will be able to correctly order seedlings and/or transplant stock from public or private nurserys using order form blanks, and complete agreements w/ landowners for custom planting.	A. Correct use of stock source catalogs and order blanks in ordering plantation stock for next planting season. B. Landowner working relationships. • Agreements and records • Completion of planting instructions and written agreement. . Ability to communicate with people developing plantations. . Keeping appointments . Securing sufficient proper information . Fulfilling owner's desires . Completing forms to enable each party to remain fully informed

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
(Ref. 6: 12-13) A. Expose students to nursery catalogs - allow them freedom to peruse catalogs and to locate stock for next planting season. Demonstrate to students how to consider prices, ages, seedling or transplant sizes, guarantees, etc. in selecting that stock best suited to the silvical and economic characteristics of the site and Christmas tree business. Provide student with a list of major planting stock suppliers with addresses both public and private.	A. Following perusal of nursery catalogs, students go through all steps necessary in selecting planting stock (as prescribed in their planting plans) of optimum quality and proper quantity. Students should fill out order blank or write satisfactory letter, write out a dummy check or money order for the proper amount, put these into an envelope they have properly addressed, and hand it all into the instructor.	A. Instructor evaluation of the accuracy and completeness and neatness of each student's work. Stock ordered should conform to student's planting plan (as corrected if necessary).
B. Meet with landowner and visit planting site.	B. Meet with landowner and travel to selected planting site. Record name and address and phone number.	B. Review student records and sketches for accuracy, completeness.
C. Complete forms and return one to class file.	C. Identify field boundaries on sketch and record approximate numbers and varieties to be planted in each field and how to be planted.	
D. Provide sample form to each student to fill out and maintain in notebook.	D. Record payment rate and method and time. Have each party sign both copies, with each party keeping one. Return copy to class file. Use class time to outline importance of above steps to assure satisfied customers and employees.	

OBJECTIVES BY UNIT	CONTENT
Obj.4.The student will be able to properly handle received planting stock in terms of: a)inspecting for damaged or otherwise unhealthy stock; and b)storing or heeling in -with the objective of having an adequate number of healthy stock of right species,size,and age classes ready for planting at the proper time.	A.Receipt of planting stock .In bundles of 1000 or other .Coding to indicate age,species,etc. .Inspection to locate unhealthy stock & disposing of same: . chopped root system . dry root system . buds lacking on leader . scarred bark . dead tops .Noting net quantity of stock received .Keep stock moist
	B.Holding of stock prior to planting .Immediate watering of drying out stock .Keep cool .Heel in stock - (Ref.1:8) • near planting site • trees side by side in trench • trench oriented east-west • trench as deep as tree roots • south side of trench @60 degree angle so trees lean south . in cool shady site . soil "heeled" in over roots & watered .Stock to be removed from trench only as fast as it is needed (100 at a time for hand planting crew or enough to fill water buckets on planting machine)
Obj.5.The student will be able to properly handle and plant by hand (in two man teams) approximately 100 trees/hour (400-600 trees/day) to instructor's standards regarding: a)safety, b)line straightness and spacing to within one foot error at all times, and c)seedling survival probability.	A. Safe use of hand planting tools .Secure heads and blades .Safe handles .Slips and falls B. Line straightness & spacing (Maintaining)- .Use of 4 poles to keep line (2 on each end of field) .Pole length used as measure between planting lines .Using pace or reach w/ planting tool to maintain spacing C. Assuring high tree survival rate .Planted in holes deep enough .Do not jam up roots(root prune if necessary) .Replace dirt,stamp with heel .Kick loose earth over tamped earth .Keep trees moist w/ water (in water) .Carry only enough trees to work a short unit of area or line (around 100 trees)

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
Brief chalk-talk prior to receiving shipment of stock-or before conducting field exercise on all parts of A & B. Student work experience in carrying out all steps on A & B.	A.Students receive working information on procedures to follow through instructor led lecture & discussion. Students should participate in counting bundles & "decoding" them-sorting as to species,age, size classes-inspecting stock for condition-adding water if necessary.	A.Optional quiz covering package coding,healthy & unhealthy stock, properly & improperly heeled in stock.
	B.Students should construct trenches, & place & heel in stock properly to assure their survival to planting time.	B.Instructor evaluation of individual student's demonstrated ability to properly handle stock when received, & to properly store stock to hold it safely before planting.
(Ref.2,1:9-10,3)Instructor Demonstrates: A.Consequences of unsafe tools and footing B.Construction & use of line poles in maintaining line and spacing C.Proper planting procedure (Ref.1:8-10) D.rapid drying out of trees root hairs when not kept wet.	Students observe instructor's demonstrations-& discuss concepts & techniques w/ him. Student crews (2-men)plant tree, establishing lines themselves. Crews should take no more than 100 trees per crew at a time from the shipping bundles or heel-in sites. (recommend each of the several crews use different colored flagging on poles to avoid crossed lines due to "mistaken identity")	Instructor grade each 2-man crew in terms of: A.Results of "tug"test to see trees are firmly planted B.Results of observation for trees planted too deeply or too shallowly, or w/ bottom of roots bent up out of the ground C.Line straightness D.Proper spacing (allow one ft. error in any direction) E.Quantity/time based on ground conditions on the basis that on good ground conditions experienced crews plant up to 200 trees/hr.Recommend rate of 100 trees/hr with 1-2 hrs.experience w/100%proper planting.

Code - 01.0706-01

Title - CHRISTMAS TREE PRODUCTION AND MARKETING

OBJECTIVES BY UNIT	CONTENT
Obj.6 The student will be able to safely,effectively,and efficiently maintain and operate wheel and/or crawler tractors with planting attachments in the planting of trees.	A. How to safely drive farm type tractor with one row tree planter attached, w/ 3-man crew (driver, planter, follow-up man). B. With tree planting bar C. Show how to shear long dangling or large bunch of roots with shears to reduce moisture loss and enable seedlings to be properly placed by machine. D. Safe and efficient operation of crawler tractor.

01.0706-01 - Code

CHRISTMAS TREE PRODUCTION AND MARKETING - Title

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
A.Mount and adjust planter on tractor. Demonstrate how to drive safely; what speed to operate at; how to raise and lower unit properly. Distance from last row. (Establish first row for the students to start from).	A.Briefly do a daily check on farm tractor(preferably row type-wide front end).Demonstrate how to start,stop,shift,brake and regulate power and speed to best operate the planter. Show how to place seedlings on planter,separate seedlings,place in ground properly,and spot test machine settings by measurement of distances and tugging on trees. Adjust planter if needed.Stress dangers of wetspots,stones,stumps, ditches,and steepness of slope and how weights may be of help.	Safe operation of wheel &/or crawler tractor at all times.Safe & effective adjustment operation of row tree planter &/or planting bar used w/ tractor. Effective daily maintenance performed on tractor & planter &/or bar. Effective root pruning of trees when necessary. Correct planting of trees, by row planter &/or planterbar & followup crews as evaluated in objective #5. Quantity/time based on ground & equipment conditions on the basis that on good ground conditions experienced crews w/ row planter can plant 800 trees/hr. Recommend 400 trees/hr. w/ 2 hrs. experience w/ 100% proper planting.
B.Construct a bar attached to wheelbolts outside and 6"longer than tires of tractor. (Ref.4:23)	B.Have 2 planting crews follow tractor across field in order to easily find holes and tramp in transplant while soil is still moist.Point out inexpensiveness of homemade planting bar and non variance of row spacings.Safety around flat stones and side hills should be stressed.	
C.Ability to prune roots effectively when needed without injury to plant for mechanical planting.	C.Show how roots too long may end up pointing up in air, thereby drying out plant or too big roots not pass through and into planting slot properly.	
D.Attach 6" lugs to growlers with angle irons usually at outside edge of tracks.Space lugs equal distance apart on track edge.Usually two on each track for small crawlers and three for medium size.	D.Briefly do a daily check on crawler tractor.Demonstrate how to start,stop,shift,steer,brake and regulate speed. Point out costs of operation Point out places where crawler can safely go and wheel tractor cannot. Use with 1 row planter if easily mounted. Have 2 crews follow tractor across field in order to easily find holes and tramp in transplant while soil still moist. Adjust planter when needed.	

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Title - CHRISTMAS TREE PRODUCTION AND MARKETING

AGRICULTURAL

OBJECTIVES BY UNIT	CONTENT
Unit 2:Plantation Improvement and Maintenance Practices Obj.7.The student will be able to safely,effectively,and efficiently conduct all normal stand and tree improvement and maintenance practices including: a)restricting animal and public damage in plantation; b) recognizing presence of common plantation pests and prescribing and carrying out preventative or control measures; and c) pruning and shaping to instructor's standards of quality at a rate averaging one foot of tree height every 15 seconds (allowing additional time for travel,equipment maintenance,and rest).	A. Plantation protection from: Livestock Deer and rabbit People • Understanding problems that can develop • how to fence properly • how to construct fire lanes or barriers • keep equipment handy and in working order • know fire number and post • How to cooperate with **conscientious hunters by allowing hunting by written permission.** • How to restrict snowmobiles to appropriate areas.
	B. Plantation protection from: Fire, insects, diseases, rodents, animals (rabbits), grass, weeds, brush, . Physical damage . Ability to recognize trees with problems and knowledge of resources available to diagnose and treatments recommended to combat and prevent future outbreaks. . Learn how to mix, apply safely, and store appropriate chemicals. Instructor should exercise caution in allowing student use of chemical herbicides,insecticides,and pesticides.Instructor may wish to limit student participation to one of observer only w/ instructor or professional applicator demonstrating the selection,mixing, & application of chemicals.In any event students should be able to read and to understand labels w/ regard to the toxicity chart (dermal & oral) for the chemicals being used, & to use extension department recommendations & safety precautions w/ the chemical.
	C. Proper pruning and shaping • How to shape a tree with various tools safely • How to restrict and direct growth • How to correct deformities • How to care for equipment

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
A.Using Bulletin #1204 outline on overhead common damages.Read with students suggested methods of protection and construct chart on overhead, listing trees problems, solutions.	A.Point out unprotected situation. Proceed to repair or construct short segment of fence (to keep out livestock). Put up appropriate area signs. Put up appropriate trail signs.	A.Check construction to determine if adequate under normal circumstances.
B.Show slide of fire swept plantation and discuss briefly. Show pictures and slides of insect damage and diseases (College of Forestry-NYS) Bulletins for specific diseases and insects No.44 European Pine Shoot Moth Mite damage and control White pine weevil Spruce Gall Cankers Foliages Non-infections Snow-wind To refer to specific controls-Cornell Recommends for Control of Christmas Tree Pests.	B.Visit selected plantations to observe presence of various diseases and injuries.Apply some controls following prevailing extension department recommendations and safety precautions. Write up report of observations and suggested controls.	B.Check to determine if treatment was successful or unsuccessful.If unsuccessful retreat.
C.Using overhead and transparencies made from Cornell Bull.#1080 or Univ.of New Hampshire Christmas Trees,p.11,demonstrate with grease pencil where and why cuts should be made.Exhibit tools used and cost of each.	C. In the plantation select various trees and demonstrate how to assess strengths and weaknesses, how to properly use various equipment such as:clippers (small & large),sickle,knife, long & short shears,power shears, circular & reciprocating.Care of & simple adjustments and touch up sharpening of tools should be demonstrated. Each student should practice with each type of equipment.	C.Count trees completed at end of given time.Observe quality according to instructions.Provide more experiences if work is below standards.Recommend average work rate of 1 ft. of tree height every 15 seconds.Add to this time allowance for travel between trees,rest,& equipment maintenance.

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Title - CHRISTMAS TREE PRODUCTION AND MARKETING

OBJECTIVES BY UNIT	CONTENT
Unit 3 :Harvesting & Marketing Obj.8 The student will be able to effectively transact business arrangements w/ Christmas tree producers, specify and tag desired trees by species, size, and grade, and color trees (if locally feasible) to suit market.	A. Current year's pricing and marketing outlets Ability to converse with active producers in a businesslike way.
	B. Marking techniques. Calculate number of trees to be cut. Judge standing trees for grade. How to tag so trees will not be missed.
	C. Standardizing by coloring. What trees to color and why. - How to prepare and apply coloring quickly and correctly - Calculate extra costs and necessary increase in selling price.
Obj.9.Student will be able to effectively and safely conduct a harvesting operation including the selection,marking,cutting,dragging, butting,bundling,and loading of trees to instructor's standards of work rate and quality given existing terrain conditions.	A. Current year's pricing and marketing outlets.
	B. Marking techniques
	C. Safe harvesting and handling to pick up or bundling point. Safe and efficient use of hand saws, chain or reciprocating blade saw, circular saws, in harvesting & butting. Direction of work crew.
	D. Bundling & Loading (operation of bundling machine) To maximize quantity loaded,Minimize damage in trans loading by grades,size,species.

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CHRISTMAS TREE PRODUCTION AND MARKETING - Title

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
A.(Ref.1:23)Visit with commercial producer and discuss how they wholesale and/or retail crop. Problems encountered and future plans.Ideally,one who does both.	A.Visit nearby producer(s). In plantation with grower,discuss his market needs for specific size and quality.Judge quality of selected trees and tag properly.	
B.Grade standing trees and tag specimens ready for available market.Use USDA pamphlet,US Standards for Christmas Trees.Oral quiz on selected trees while in field.	B.Visit plantation with equipment serviced and ready.Students select trees to color.Color some they did not select too,to standardize plot and load.	B.Oral quiz in field to determine judgment ability on grades using grower as final checker.
C.Point out trees with poor or varying color.Show commercial containers of coloring and read directions to group.Mix small amount properly and apply with mist blower.Compare to untreated trees nearby.Discuss costs per tree for machine,man and materials. Extra value of tree if any,maintain public image,etc.	C.In plantation have students perform all operations simultaneously.	C.Check coverage.If not complete have student redo.If too slow provide more practice.Recommend work rate average of 100 trees/hr.
A.Visit with commercial producer and discuss how they wholesale and/or retail crop.Problems encountered & future plans.Ideally one who does both.	A.Students free to ask questions and discuss.	
B.Grade standing trees & tag specimens ready for available market.Use USDA pamphlet,US Standards for xmas trees.	B.Students individually grade and tag small number (10) of trees.	B.Oral quiz in selected trees while in field.Check on trees graded & tagged for correct student procedure.
C.Divide group into crews of 3-4. Assign area or rows.Provide with different tools for harvesting. Demonstrate for proper use & care. Members try all jobs of cutting, dragging &crew chief.Demonstrate correct butting.	C.Students gain experience with variety of power & hand tools in locating tagged trees,cutting & dragging them.Students gain experience in supervisory role. Students gain experience in butting—providing a handle on tree to assure it will stand straight in & fit in customer's xmas tree stand.	C.Check crew's total hourly production and quality of butting.
D.Outline and demonstrate processes Cornell Bull.#1204,p26.Set up crew to do job.Change crews so all have experience.	D.Students bundle & load trees to gain experience in maximizing number loaded for safe transport while minimizing damage to trees. Learn to load trees by grades, species,or size.	D.Check crew's ability to operate bundler & to load trees in terms of: quantity per load,damage prospects, load secure,division of load by species,size,or grade.

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Title - CHRISTMAS TREE PRODUCTION AND MARKETING

AGRICULTURAL

OBJECTIVES BY UNIT	CONTENT
Obj.10.The student will be able to safely and effectively carry out a Christmas tree sales project including: procurement,storage,and exhibiting of trees;dealing with customers,cash receipts,and financial records;and inventory and storage of sales lot equipment. Excellent class or FFA group money raising project.	A. Obtain _______ number of graded trees. . Negotiate written agreement - Proper stacking and storage . Talk with producer or cut own. Stack and store properly at sales point. B. Exhibit product and advertise locally. . How to build display stands or racks. How to arrange same. . How to price and mark or group trees. . How to make simple attractive satisfactory signs . How to install effective useful lighting C. Making sales. Know your product. Learn what people want. How to show a tree. How to satsify their desires. How to ring up sales and make change. D. Sales - Complete cost analysis: • How to calculate all expenses • How to record all income • How to determine profit or loss E. Clean up and storage of equipment. Taking care of equipment properly.

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CHRISTMAS TREE PRODUCTION AND MARKETING - Title

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
A.Secure a written agreement with local grower for ______ trees on a purchase or consignment basis, or cut own trees. Pick up or have trees delivered.	A.Students read written agreement for purchase or consignment of trees. Students examine trees when delivered at lot. Butt, prune,or discard damaged trees. Students count saleable trees to compare w/ number by size, species & grade contracted for.	A.Check written contract check student's work on "repairing" & counting trees.
B.Show how to build and set up an attractive,functional,comfortable sales area.Show how to price trees and mark so customer knows price.Show how to make quick effective displays and signs.One crew can set up lot while second crew makes and puts up signs.	B.Have students plan out lot and build exhibit area. Put up displays and advertising	B.Observe quality and rate of work. Criticize work on the job.
. Show students through role playing how to talk to customer to discover what they like for a tree in size,shape,quality and how expensive a tree they want. Emphasize esthetic value of real tree compared to artificial. -Show how to "show" a tree -Show how to operate cash register and make change -Show how to handle sales tax	C. Operate sales lot during class time and/or evenings and weekends.	C.Observe sales techniques. Check cash receipts w/ group treasurer.
D.Demonstrate how to calculate all expenses incurred by retail operator. -Cost of trees -Cost of handling and delivery -Cost of display and sales area -Cost of building,lights,insurance -Cost of complimentary products such as stands,delivery to homes -Income from tree sales -Income from complimentary products -Profit or loss -Tax (sales)	D. .Each student should individually use cost data & income data (distributed by instructor) to calculate each of the nine items listed under teaching method.	D .Correctness of student's calculations.
E .Show how to inventory equipment. Show how to properly store equipment for future use.	E. Each student should inventory all equipment used on lot sales project & submit list to instructor. b.Students store equipment properly.	E. Completeness & organizational neatness of student work. b. Work rate & work quality.

MODULE OF INSTRUCTION

Title - CHRISTMAS TREE PRODUCTION AND MARKETING Code - 01.0706-01

RESOURCE MATERIALS

Bulletins:

1. Christmas Trees - A Cash Crop - University of New Hampshire, Durham, New Hampshire
2. Planting Forest Trees - Cornell University, No. 1161 - Ithaca, New York
3. Forestry Bulletin No. 2 - NYS Conservation Department, Albany, New York
4. Planting Forest Trees - on New York Farms - No. 956 - Cornell University
5. Know Your Trees - No. 85 - Cornell Univ., NYS College of Agriculture, No. 94- USDA Forest Service
6. Plantation Production of Christmas Trees - No. 1204 - Cornell University
7. Tree Diseases in New York State Plantations - No. 44, NYS College of Forestry Syracuse - $.80
8. Cornell Recommends for Control of Christmas Tree Pests - NYS College of Agriculture
9. Cornell Bulletin 1080 - NYS College of Agriculture
10. U.S. Standards for Christmas Trees - USDA
11. Tree Planting, Where, What, When and How - Forest Management Leaflet No.1 State of New York Environmental Conservation Dept. 1967

Periodicals:

12. NYS. Conservationist - Centerfold - December-January 1959-60
13. Conservation Circular - Fernow Hall - NYS College of Agriculture - issued quarterly-mailing list
14. NYS Christmas Tree Growers Annual Report - Conservation Dept., Cornell Univ., Ithaca, New York - small charge
15. Nursery Stock Catalogs - mailing list

Audiovisuals:

16. Slide of fire damage - Forest Service Dept. or personal file.
17. Slide Set-Insect Damages and Diseases - NYS College of Forestry
18. Local soils maps - SCS office

MODULE OF INSTRUCTION

Title - MAPLE PRODUCTS PRODUCTION

Code - 01.0706-02

DESCRIPTION:

The student will be involved in the production of maple products from the selection of trees to be tapped in the grove, to the making of hard sugars, and other maple products.

A contract may be drawn up that will allow students to tap trees in a specific sugarbush block and records kept on production costs and syrup produced.

MAJOR DIVISIONS OR UNITS OF CONTENT:	Time Allocations	
	Class	Other
1. Setting up the sugarbush for sugaring	0	15
2. Collecting and evaporating the sap		
3. Grading syrup and making sugar products	2	2
4. Cleaning, inventorying, and storing of equipment	0	4
5. Yearly managament of the sugarbush	0	6
6. Conclusion	1	0
	3	27

Revised June, 1974

MODULE OF INSTRUCTION

Title - MAPLE PRODUCTS PRODUCTION

Code - 01.0706-02

OBJECTIVES to be obtained:

The student will be able to:

1. Identify (in a commercial or potentially commercial sugarbush) sugar and black maples and the number of taps that should be made on each to a degree of 100% accuracy (based upon species and size identification).
2. Correctly identify by common name and basic use to instructor's standards all sugarbush operation equipment as listed.
3. Correctly and efficiently tap w/hand and/or power equipment all "mature" sugar and black maples within a specified block of a sugarbush to instructor's standards re: 11 factors.
4. Effectively and efficiently hang buckets, and/or plastic bags, and/or plastic line to instructor's standards regarding three to eight factors.
5. Safely, effectively, and efficiently gather sap for deposit in storage tank to instructor's standards.
6. Safely, effectively, and efficiently operate an evaporator to instructor's standards.
7. Safely, effectively, and efficiently test, process, and package maple products to instructor's standards.
8. Effectively and efficiently clean, inventory, and store all equipment used in the sugaring operation to instructor's standards.
9. Demonstrate ability to apply sugarbush management principles in the field following proper instruction in other modules by reciting or writing correctly from memory, to instructor's standards, information pertaining to thinning, weeding, and protection.
10. Comprehend that many important facts about the management and operation of a sugarbush have not been given him and that he should make himself familiar w/these facts if he should wish to start an operation of his own.

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Title - MAPLE PRODUCTS PRODUCTION

OBJECTIVES BY UNIT	CONTENT
Unit 1.Setting Up The Sugarbush for Sugaring. Obj 1. The student will identify (in a commercial or potentially commercial sugarbush) sugar and black maples and the number of taps that should be made on each to a degree of 100% accuracy (based upon species and size identifications).	A. Identification of Sugar &/or Black Maple tree Distinguish from other tree species B. Eyeball measurement of tree to determine proper number of taps DBH - No.taps 0-10" - 0 10-17" - 1 17-24" - 2 24-30" - 3 30" + - 4
Obj. 2 The student will correctly identify by common name and basic use to instructor's standards all sugarbush operation equipment as listed.	A. Tapping Equipment . 7/16" bit . Bit brace &/or breast drill &/or power tapping drill . Spiledriver or claw hammer . Spile (metal &/or plastic) . Pills,powder,or solution for sanitizing taphole B. Gathering Equipment . Sap buckets,lids,plastic bags . Plastic tubing and pipe . " " " " connectors . Gathering pails . " tank . Storage " C. Boiling & Packaging Equipment .Sap House .fire extinguisher .first aid kit .ventilator .Pans .arch .back pan .finishing pan .ventilator .chimney stack .Filtering equipment .syrup prefilters & filters .filter can .Fuel .storage .lines & valves .burner .Measuring & testing devices .skimmer-strainer .dipper .sap hydrometer .syrup " .thermometer .syrup grading set D. Cleaning & storage equipment & areas.

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MAPLE PRODUCTS PRODUCTION - Title

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
A.Educational TV Channel B.Slides-see reference C.Bulletins--(Ref.B.4) D.Tree specimans(leaf,twigs & bark) teacher collects E.Field Trip	Students learn,through practice & study to identify sugar &/or black maple trees as distinguished from other tree species.	Field quiz of trees under natural conditions w/ leaves off for identification as to proper species & proper number of taps prescribed.
Demonstration & explanation (opportune time for this objective is when transporting equipment from storage to the bush-at either end of the transportation students should handle,observe,& hear about the name & function of each article of equipment) (Reference B.1.&B.2.) (Inspect all equipment for cleanliness & clean if necessary-see (Unit 4,Obj#7,A))	Observation,handling & naming each piece of equipment. Breaking all equipment out of storage & transporting it to place of operation.	Delay evaluation till last week of module by which time students should have worked w/ all of the equipment. At that time tag equipment by number & have students identify by name & function.

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Title - MAPLE PRODUCTS PRODUCTION

OBJECTIVES BY UNIT	CONTENT
Obj.3.The student will correctly & efficiently tap w/ hand &/or power equipment all "mature" sugar & black maples within a specified block of a sugarbush to instructor's standards re: 11 factors.	A. Factors in tapping .Rate of accomplished work .Proper species tapped . " number of taps per tree . " location of " on tree w/regard to each other & to past taps(not above,below,next to visible old taps) . Proper depth of tap(2-3"deep) . Proper angle of tap(slightly upward) . Proper use of microorganism growth retardent . Proper driving of spile to prevent bark split . Proper driving of spile to prevent spile damage . Proper observance of temperature conditions on timing of tapping (no tapping should be done at temperatures below 20°F.) . Carry spiles & connectors in chlorine solution
Obj.4. The student will effectively, & efficiently hang buckets,&/or plastic bags, &/or plastic line to instructor's standards regarding three to nine factors.	B. Hanging buckets &/or plastic line .Buckets &/or plastic bags . one on ea. spile . securely attached . lid on & fitting securely .Lines .spiles vented properly . 5/16" line not overloaded . proper line grade maintained . " use of wire supporting lines . " avoidence of heavy shading of lines

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
A & B: Instructor chalktalk Instructor demonstration in field.	Students form into crews of 2-3 men per crew and commence tapping & hanging buckets &/or line in their specific sugar-bush block	Evaluation by inspection & time record of student work. Evaluate work in terms of the 11 tapping factors and 3 to 9 factors pertaining to the hanging of buckets &/or plastic line. Tapping and hanging buckets rate of work: Experienced 2 man crews can hang 500 to 600 buckets/day w/ hand bit; 500 buckets/day man w/ power tapper. Recommend 50% that rate for student crews.

OBJECTIVES BY UNIT	CONTENT
Unit 2.Collecting & Evaporating the Sap Obj.5. The student will safely, effectively,& efficiently gather sap for deposit in storage tank to instructor's standards.	A. Operation & maintenance of wheel & crawler tractors & trucks in general bush maintenance & in sap gathering during operation. B. Use & maintenance of sap gathering equipment including: .Carrying & dumping sap through buckets, gathering pails,gathering tank,to storage(holding)tank. .Inspection of taps & corrective action taken for dry or leaky tap holes .Inspection of buckets for cleanliness &/or leaks & correction if necessary .Inspection of plastic lines for leaks, excessive shading,proper grade,frozen in & correction if necessary .Maintaining sap quality control through; •disposal of sap fouled by animals •pulling spiles when sap becomes foul smelling due to budswelling •cleaning buckets & spiles & lines w/chlorine solution &/or scalding when bacterial mucous formation is encountered indicating sour sap. •regular straining out of leaves,twigs,etc at gathering tank &/or when dumping into storage tank. •dumping of ice to maintain higher sap sugar concentration or save ice to maintain cooler sap in storage tank .Operation & maintenance of vacuum pump on lines where used. C. Testing sap for sugar content & proper recording of data. .Sap hydrometer reading tells number of gallons of sap boiled down to yield one gallon of syrup by rule of "86".(ref B-1,pa40-41) .Sap hydrometer reading should be recorded for incoming batch of sap to leave a record of sugar concentration of sap from a specific area of the bush & for the sugar content of the sap in the storage tank after each dumping (to keep evaporator operator constantly aware of the concentration of his incoming raw sap supply)(ref B-1,pa41-42)

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
A.Demonstration of proper maintenance & operation of vehicles. Proper safety precautions discussed re: the conditions prevailing in the bush (snow,mud, ice,steep grades,overhangs,etc.) (Ref:Operators manuals provided w/vehicle)	A.Student operates & maintenances all motor vehicles(to instructors discretion)used in the sugarbush operation.	A. Observation of student operation w/ regard to smoothness, efficiency,& safety of operation. .Collecting & critique of student maintenance records on motor vehicles.
	B.Students by crews gather sap & maintain collection equipment in their specified block of the bush and maintain gathering equipment shared w/other crews on a prorated business.	B.Observation of students at work.Instructor must set standards of work-rate based on terrain & conditions in the bush. Check for evidence of faulty inspection of gathering equipment(lids off,wet tree trunks below taps,leaking lines,etc.)
C.Demonstration of use of sap hydrometer & recording of data.	C.Students test for sugar concentration(number of gallons of raw sap required to yield one gal. of syrup)each time they bring in sap to dump into storage tank: .Sap in gathering tank & record data .After dumping test sap in storage tank & record data.	C.Observe students while testing to assure ability to make accurate reading & maintain observance of records re: completeness,probability of accurateness,and neatness.

OBJECTIVES BY UNIT	CONTENT
Objective 6. The student will safely, effectively, & efficiently operate an evaporator to instructor's standards regarding:	A. Periodic safety inspection of boiling system . Fire extinguisher . First aid kit . Shields & covers . Fuel lines and storage area . Safety gloves, glasses, aprons B. Calibrations . Set thermometer to 7°F above estimated boiling point of water . Sap hydrometer reading to determine sugar concentration to enable approximate or precise setting of sap depth in pens. C. Boiling (sap should be boiled w/in 24 hrs. of collection) . Beginning . flood evaporator to depth of one inch or more in front pan . adjust line from storage tank to pans to assure steady regulated sap flow . ventilator set to draw steam properly . fire the arch & adjust draft &/or fuel heat if necessary to maintain clean steady heat. . dip sap in front of pan into back of pan till desired sap concentration flow to front is obtained . measure temperature of boiling sap & calibrate draw off temp of thermometeter accordingly. . filtering . Skim off scum that rises & dispose of properly-maintain clean work area! . Use of boot or flat felt or woolfelt filters w/ a prefilter to filter hot syrup. Dispose of or clean prefilter when clogged with sludge. Clean felt or woolfelt filter in boiling water or sap (not in pan!) & return to filtering w/same side up. (Do not change direction of syrup flow through filter) Filters generally have to be dipped in boiling sap before using. . drawing off (Ref. B-2,pa42-45) (Ref.B-2,pa 34-35) . at 7°F above boiling point of water . (4°F + " " " " " if using a separate finishing pan)

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
A. Instructor demonstrates steps in inspection.	A. Student carries out inspectio & does not begin operation until all safety measures are satisfactory and takes proper steps should a "working" safety measure fail.	A. Instructor regularly inspects for student thoroughness.
B. (Ref.B-1,pa 41-42) Instructor demonstrates measurements & calculations & calibrations Stress regular (hourly) sap concentration measurement & adjustment of sap level in pan.	B. Student carries out the setting of draw off temperature &/or hydrometer reading to be had at draw off, takes & records hourly the required sap hydrometer readings & adjusts sap levels accordingly (if the boiling operation is that refined).	B. Instructor checks student records (kept i boiling room) for completeness, probability of accuracy, neatness. Instructor checks to see existing boiling practices are in line w/ current recorded data.
C. Demonstration Close surveillance (teacher aide helpful during boiling) (Ref.B-1,pa41-46) (Ref.B-2,pa 33-36)	C. Student gains practical work experience in carrying out all phases of the boiling process.	C. Instructor evaluates student's boiling ability in terms of safety, efficiency, cleanliness & effectiveness on all phases of boiling listed.

OBJECTIVES BY UNIT	CONTENT
Obj.6 (continued in CONTENT)	. drawing off (continued) • coordination of drawoff,replenishment from back pan,& temperature (cease drawing off when temperature drops below 7°F above boiling point of water. • use of thermometer, syrup hydrometer w/thermometer, & dipper to observe for sheeting of syrup in determining draw off timing. • maintain bucket of water or sap to flood front pan if there is a threat of scorching the pan. . shutting down (Ref.B-2,pa 34) . drain front pan & store contents overnight . flood pans w/sap enough to cover till pans cool . shut down fire . skim sap & strain sediment before next firing the arch . arrange for flow reversal if pans are outfitted for it. . if running out last of sap in storage use water in storage tank to follow sap into pans to depth of 3" + before shutting down fire. . cleaning evaporator . frequently enough to prohibit sugar sand deposit building up in front pan . clean inside & bottom of pans . use water,acid solution,proper clothing to protect from acid,other commonly found cleaning agents (Ref.B-1 pa 45-46) . thoroughly rinse before using .store pans cleaned,inverted,& in a clean,dry area

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES

OBJECTIVES BY UNIT	CONTENT
Unit 3. Grading syrup & making sugar products Obj.7. The student will safely, effectively,& efficiently test, process & package maple products to instructor's standards regarding:	A. Maintaining sanitary & quality standards in production & packaging .Use of grading bottles for syrup .Hot canning of syrup B. Cooking,grading & packaging processes for some or all common maple products including syrup • syrup • candies • sugar • spread • cream • fluffed products • butter
Unit 4.Cleaning,Inventorying & Storing of Equipment Obj.8. The student will effectively & efficiently clean,inventory,& store all equipment used in the sugaring operation to instructor's standards.	A. Cleaning equipment at end of boiling season. . Clean & service all equipment before it is moved to another job or stored.Part of cleaning should be observation for damaged or missing equipment. . Plastic lines-pump clorox solution (5 to 1, water to clorox) through lines 10-15 minutes at rate of 1 g.p.m. dry by hanging.(REF.B-2,pa24) . Metal equipment other than evaporator & filter can be, generally, cleaned in clorox-water solution & rinsed & dried. . Equipment with scale deposits from syrup may be cleaned using a variety of mild acid solutions.See reference or consult experienced producer for detailed information.Thoroughly rinse after cleaning. (Ref.B-1,pa 45-46) B. Inventory .Check for cleanliness . " " damage: repair record for replacement . Record on formal inventory sheet C. Storage .Clean,dry,secure storage area .Store plastic in cool,dry,dark area.

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MAPLE PRODUCTS PRODUCTION - Title

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
A.Lecture-Demonstration by Health Dept.official and by food quality expert or by recognized producer of quality maple products. (Ref.B-1,pa 59, 78-79)	A. Student to hot can & grade syrup .Student to read regulations regarding quality control in the production & packaging of syrup	A. .Observation of student's ability to correctly hot can & grade syrup. .Written quiz regarding significance & content of regulations regarding quality control in syrup production.
B.Lecture-Demonstration by person experienced in maple products production. (Ref.B-1,pa 75-94)	B.Student may participate in processing and/or packaging a maple product other than syrup.	B. Instructor's discretion.
A.Demonstration & lecture re: techniques of prescribing,mixing, & applying cleaning agents. Student work experience.	A-B-C. Students clean,inventory & store equipment.	A.Observation of crew's work quality & rate of work.
B.Demonstration Supply students w/sample inventory sheets Student work experience		B.Have student crews hand in inventory sheets & observe accuracy & neatness of work.
C. Demonstration Student work experience		C.Observe student crew's rate & quality of work.

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OBJECTIVES BY UNIT	CONTENT
Unit 5. Yearly management of the sugarbush Obj. 9. The student will demonstrate ability to apply sugarbush management principles in the field following proper instruction in other modules by reciting or writing correctly from memory, to instructor's standards, information pertaining to thinning, weeding, & protection.	A. Thining to obtain optimum .Tree form . " spacing . Age distribution .evenaged stand .all or staggered agedstand .removal of overmature trees . " " diseased trees B. Weeding .Removal of competing brush & tree species .Selective removal of non-sugar producing trees for wood products .Review of chemical & mechanical methods of weeding C. Protection (recognition, prevention, prescription) for protection from .Insect infestation .Diseases .Animal damage .Grazing by domestic animals .Fire
Unit 6. Conclusion Obj. 10. Comprehend many important facts about the management & operation of a sugarbush have not been given him & that he should make himself familiar w/those facts if he should wish to start an operation of his own.	A. Records, contracts & accounts B. Specs on construction of sugarbush facilities C. Costs . Of facilities & equipment . Of operation D. Sales techniques E. Precision instrumentation F. Quality control & pertinent regulations governing quality in production & packaging G. Silvics of sugar maple management H. Seasonal & daily weather patterns & their influence upon the sugaring operation

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MAPLE PRODUCTS PRODUCTION - Title

TEACHING METHODS	STUDENT APPLICATION ACTIVITIES	EVALUATION PROCEDURES
A.B.C. Demonstration Field observation (Ref.B-2,pa7-13) (Ref.B-2,pa 7-13) (Ref. B-2,pa 14-15)	A.B.C. Students observe in field &/or through audio visual presentations sugarbush conditions before & after thinning, weeding,& protection practices have been applied.	A.B.C. Instructor may evaluate student understanding w/a written exam; or in the field through verbal responses to situation problems requiring recognition of the need for cultural treatment,ability to prescribe correct treatments.
Brief review of information not strongly covered on module. Purpose: to let students know what facts they should consider & research should they wish to begin their own commercial sugaring operation. Recommend school supply (free or at cost) students w/ a comprehensive sugaring manual for their reference.(ref.B-1) & (ref. B-2)	Students listen, ask questions & list items in lecture notes for reference at later date if needed	None

MODULE OF INSTRUCTION

Title - MAPLE PRODUCTS PRODUCTION Code - 01.0706-02

RESOURCE MATERIALS

A. Periodicals -

1. National Maple Syrup Digest
   Bainbridge
   New York
2. Maple Producers Supply Catalog
   Vermont Evaporator Co., Ogdensburg
   Leader Maple Supplies
   Cook Farm Supply
   DeRuyter, N. Y.

B. Bulletins -

1. Agric Handbook #134 USDA Maple Prod. Handbook, 112pp, revised 1965,$.60
2. Cornell Extension Bulletin, 974
3. Cornell Extension Bulletin, 1125
4. Know Your Trees, 4-H, 85
5. U.S.D.A. Home Garden, No. 81
6. U.S. Dept. of Agr., ARS 73-26

C. Books -

1. Conservation of Natural Resources
   Dept. of Conservation, Cornell Univ.

D. Audio-Visual -

1. N.Y.S. College Film - (kodachrome slides-Maple Syrup Production)Changing Maple Country (movie) Modern Maple Confections (movie)
2. Educational TV Channel 24
3. Slide set on local sugarbush - Teacher produced
4. I.M.Service - Agr.Ed.Cornell: (latest information and materials)
   Don Gurgett